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by
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I. Introduction: Domain Name Policy

"Dotcom" has acquired economic and cultural significance. There has been a dotcom boom and a dotcom bust.[1] Dotcommers grew wealthy and went bankrupt,[2] and a television sitcom parodied this now familiar scenario.[3] Amazon.com,[4] Yahoo.com,[5] Google.com,[6] and Ebay.com[7] have enormous market capitalizations[8] and have begun to have transformational effects[9] on the International economic system. "FearDotCom" is the name of a feature motion picture—in the horror genre, of course,[10] and "Startup.com" was a successful documentary.[11]

But what does the word—or is it a phrase?[12]—"dotcom" mean? "Dotcom" is the transliteration of the string of characters ".com" which form part of a domain name, essentially a name for an address on the Internet.[13] In the nomenclature of the Domain Name System

1. *See* Phil Mullan, *SPIKED, From Dotcom Boom to Dotgloom* <http://www.spiked-online.com/Articles/000000005496.htm> (Feb. 12, 2001).

2. *See* Lisa Margonelli, *SFGate.com, Frank's Depression: The Boom-bust of a Dotcommer's Identity* <http://www.sfgate.com/columnists/moneytales/> (Jan. 22, 2003).

3. *See* TVTome, *The Ellen Show* <http://www.tvtome.com/tvtome/servlet/ShowMainServlet/showid-3163/> (accessed Mar. 12, 2003).

4. *See* Amazon.com, *Amazon.com Home* <http://www.amazon.com> (accessed Feb. 9, 2003).

5. *See* Yahoo!, *Yahoo!.com Home* <http://www.yahoo.com> (accessed Feb. 9, 2003).

6. *See* Google, *Google Home* <http://www.google.com> (accessed Feb. 9, 2003).

7. *See* Ebay, *Ebay Home* <http://www.ebay.com> (accessed Feb. 9, 2003).

8. *See* Yahoo!, *Yahoo! Finance, Quotes & Info, Profile for Amazon.com, Inc.* <http://finance.yahoo.com/q/pr?s=amzn> (accessed Nov. 3, 2003) (indicating market capitalization of Amazon.com equals 8.32 billion dollars); Yahoo!, *Yahoo! Finance, Quote & Info, Profile for eBay, Inc.* <http://finance.yahoo.com/q/pr?s=ebay> (accessed Nov. 3, 2003) (indicating market capitalization of eBay equals 22.3 billion dollars); Yahoo!, *Yahoo! Finance, Quotes & Info, Profile for Yahoo! Inc.* <http://finance.yahoo.com/q/pr?s=yhoo> (accessed Nov. 3, 2003) (indicating market capitalization of Yahoo! Equals 10.4 billion dollars). By way of comparison, the market capitalization of General Motors is 20.2 billion dollars. *See* Yahoo! *Yahoo! Finance, Quotes & Info, Profile for General Motors Corp.* <http://finance.yahoo.com/q/pr?s=gm> (accessed Nov. 3, 2003).

9. *See* Sue White, *Are You 'On Course' With eBusiness? Or Are You Lost at 'EC?'* <http://www.ecommquest.com/pages/oncourse.shtml> (accessed Mar. 20, 2003).

10. *See* Warner Bros., *Fear Dot Com* <http://feardotcom.warnerbros.com/?fromtout=video_a2> (accessed Mar. 20, 2003).

11. *See* Yahoo! Movies, *Startup.com* <http://movies.yahoo.com/shop?d=hv&cf=info&id=1804383693&intl=us> (accessed Mar. 20, 2003).

12. Both dotcom and dot com are used.

13. *See* Network Working Group, *Domain Names – Concepts and Facilities, Requests for Comments: 882* <ftp://ftp.rfc-editor.org/in-notes/rfc882.txt> (accessed Feb. 16, 2003) (describing domain name system).

(DNS), dotcom is a Top Level Domain (TLD), the sibling of .net, .org, .edu, .gov, .mil, and .int. Dotcom is called a *generic* Top Level Domain or gTLD, in contrast to the geographically specific *country code* Top Level Domains or ccTLDs, such as .uk or .fr—assigned to the United Kingdom and France respectively. In addition, there is another, more obscure, category of TLDs, the infrastructure Top Level Domains (iTLDs)—which we discuss very briefly below.[14] Today, control over the creation of new top level domains rests with a private nonprofit corporation called the Internet Corporation for Assigned Names and Numbers (ICANN). This article addresses the fundamental policy questions that ICANN must face with respect to the TLDs: Should new gTLDs be created, and if so, what policies and procedures should govern their creation?

We answer these questions at two levels. We begin at the level of theoretical economic analysis; we then move to the level of specific policy recommendations. En route, we discuss policies and practices in comparable telecommunications industries. Our bottom line is a proposal for ICANN to conduct an auction of a significant number of new gTLDs.[15] We demonstrate that an auction will best serve the interests of Internet users (including end users and information providers),[16] while preserving the stability of the Internet.

By way of preview, at the first level, we present a framework for evaluating domain name policy in general and TLD policy in

14. *See infra* n. 112 and text accompanying note (discussing .arpa, the only member of the iTLD category).

15. *See infra* pt. IV (A Proposed Model for Expansion of the Name Space).

16. We will adopt the following taxonomy to refer to the various groups that use the Internet:

- *Internet users*—this group includes individuals, groups, firms and other entities that use the Internet, including those who register domain names and provide content or service on the Internet as well as those who consume those services or that content.
- *End users*—this group includes those who consume but do not produce information communicated by the Internet. For this purpose, an ordinary consumer, who browses the web, downloads files via ftp, sends and receives e-mail, and occasionally serves up information (for example, through a cookie stored on their hard drive) counts as an end user—even though, technically speaking, such a user does provide information over the Internet.
- *Information providers*—this group includes all those who serve up information (or content in the wide sense) over the Internet, except those who are defined as end users. For example, anyone who is the proprietor of a website would count as an information provider. E-commerce businesses, those who host FTP sites, those who run SMTP servers, and so forth, all are information providers.

From these definitions, it follows that domain name registrants who actually use their domain name to point to a host that provides information are what we call *information providers*.

particular. We demonstrate that the domain name system is what economists call a "private good" and not a "public good."[17] We will elucidate the meaning of these terms in some detail below. At this stage, we ask readers who are unfamiliar with the technical economic meaning of the phrases "private good" and "public good" to withhold judgment about both the soundness and the normative implications of our assertion that the DNS provides a private good (Wait until you see what we mean, before you decide that you disagree!). We then show that, because of what economists call "networking effects," root service, the part of the domain name system that handles the gTLDs, is a natural monopoly.[18] At the first level of analysis, we establish that gTLD policy ought to take into account these two fundamental economic facts: (1) domain name service is a private good, and (2) root service is a natural monopoly created by networking effects.

At the second level of analysis, we argue for a specific set of conclusions about gTLD policy. In particular, we demonstrate that there is a compelling case for allowing the market to operate in the creation of new gTLDs. This could be accomplished through a variety of mechanisms, including a rule of first occupation or through an auction. Although the creation of gTLDs should allow for the operation of market forces, it does not follow that ICANN itself should act as a profit-maximizer. Instead, we reason that, because ICANN is a non-profit corporation and because it is the trustee[19] for a natural monopoly, ICANN ought to act in the public interest. At the second level of analysis, we conclude that ICANN should structure the expansion of the root in a way that ensures the stability and efficiency of root service. We offer a specific proposal for an auction of new gTLDs, and show that this approach offers substantial advantages over current domain name policy.

Our conclusions at both levels are reinforced by a set of comparisons between the policy questions faced by ICANN as both a participant in, and regulator of, the DNS and with analogous policy questions faced by market participants and regulators in other sectors of the telecommunications system. In particular, we argue that there are important insights to be gleaned and lessons to be learned by comparing domain name service with broadcasting and telephone service.

17. *See infra* pt. II(B) (Domain Name Service Is Not a Public Good).

18. *See infra* pt. II(C) (Networking Effects and the Root Service Monopoly).

19. We mean "trustee" in the broad (or figurative) and not the narrow (or legal) sense.

This introduction of our Article begins with a brief description of the DNS and a very short account of its history.[20] Our next step is to investigate ICANN as an institution, focusing on ICANN's legal status and governance structure.[21] We then recount the history of ICANN's recent decisions regarding the creation of new gTLDs.[22] We conclude this introduction with a roadmap to the remainder of the essay.[23]

A. The Domain Name System

This section provides an overview of the domain name system (DNS) by answering a series of questions:

- What are domain names?[24]
- Why are domain names important?[25]
- How are domain names created?[26]
- How does the domain name system work?[27]

1. What are Domain Names?

The Internet is a powerful communications system. The operation of that system requires that every computer (or server) on the Internet have a unique identifier. Routing data on the Internet is accomplished *via* addresses consisting of Internet Protocol Addresses (IP Address),[28] sometimes called Internet Protocol Numbers (IPN),[29] each of which consists of four values ranging from 0 to 256 separated by periods (or dots), for example "255.21.1.12." Very roughly, the IP Address of a computer on the Internet is the equivalent of the phone

20. *See infra* pt. I(A) (The Domain Name System).

21. *See infra* pt. I(B)(2) (The Internet Corporation for Assigned Names and Numbers).

22. *See infra* pt. I(C) (Generic Top Level Domains).

23. *See infra* pt. I(D) (A Roadmap to the Arguments).

24. *See infra* pt. I(A)(1) (What are Domain Names?).

25. *See infra* pt. I(A)(2) (Why are Domain Names Important?).

26. *See infra* pt. I(A)(3) (How Are Domain Names Created?).

27. *See infra* pt. I(A)(4) (How Does the Domain Name System Work?).

28. *See* Webopedia, *IP Address* <http://www.webopedia.com/TERM/I/IP_address.html> (modified Sept. 23, 2002); SearchWebservices.com, *Definitions: IP Address* <http://searchwebservices.techtarget.com/sDefinition/0,,sid26_gci212381,00.html (last updated Jan. 7, 2002); The Beeline, *Web Definitions* <http://bton.com/tb17/webdefs/i.html> (accessed Mar. 20, 2003).

29. *See* TELEcomputers.com, *Acronyms Online* <http://acronymsonline.com/acronyms/i_acronyms.htm> (accessed Mar. 20, 2003); Spirit Sector <http://www.spirit-sector.de/techlex_i.html> (accessed Mar. 20, 2003); Webhosts4Free, *Webhosting Glossary* <http://www.webhosts4free.com/definitions/ip-number.php> (accessed Mar. 20, 2003).

number of a telephone, video telephone, or facsimile machine that is connected to the telephone network.

Like phone numbers, IP Addresses are relatively difficult to remember.[30] The DNS allows an information provider[31] to register a domain name corresponding to an IP Address. Rather than entering a meaningless string of numbers to access the website of the International Business Machines corporation, one can instead enter a domain name, for example www.ibm.com—more or less the equivalent of 1-800- IBM-CORP.[32] The DNS allows the domain name to be translated into the corresponding IP Address, much like a telephone book allows subscriber names to be translated into their unique telephone numbers.[33]

A domain name, such as "www.ibm.com," consists of parts, themselves called "domain names" separated by periods or dots, *i.e.* ".". These parts are organized into a hierarchy of levels. The top level of the hierarchy is at the end of the string, reading from left to right. Thus, the domain name "www.ibm.com" has as its top (or first) level ".com," and this is a top level domain name (TLD). The second level of "www.ibm.com" is ".ibm"; this is called a second-level domain name (SLD). The third level of "www.ibm.com" is "www" and this is, of course, a third level domain name (3LD). The hierarchy can be extended indefinitely, but most domain names in widespread use have only three levels.[34] Each domain name designates a domain, functionally a set of IP Addresses to which the server for the domain can point when queried for a name in the domain. Thus, the name server for Amazon.com can point to the IP Address for www.amazon.com. One level up, the name server for .com can point to the IP Address for Amazon.com.

30. For the analogy between IP Addresses and phone numbers, *see* Positive Software, *Editing DNS Settings* <http://www.psoft.net/HSdocumentation/user_nomenu/editing_dns.html> (accessed Mar. 20, 2003); ValueWeb, *What is DNS and How Does it Work?* <http://www.valueweb.com/support/getting-started/dns-faqs.htm> (accessed Mar. 20, 2003); LokBox.net, *What is DNS?* <http://www.lokboxsoftware.comhelp/html/DNS/WhatIsDNS.htm> (accessed Mar. 20, 2003).

31. *See supra* n. 16 (defining information providers in contrast to end users).

32. A number of vendors offer both 800 numbers and domain names. *See, e.g.*, <http://www.getatollfreedomain.com> (accessed Mar. 20, 2003).

33. *See* DNS.net, *DNS Overview and General References* <http://www.dns.net/dnsrd/docs/whatis.html> (accessed Mar. 20, 2003); Request for Comment: 1034, <ftp://ftp.rfc-editor.org/in-notes/rfc1034.txt> (accessed Feb. 9, 2003); Webopedia, *DNS* <http://www.webopedia.com/TERM/D/DNS.html> (June 24, 2002).

34. The initial description of the domain name system is found in Request for Comments: 920, authored by Jon Postel and J. Reynolds. *See* J. Postel & J. Reynolds, *Domain Requirements* <http://www.rfc-editor.org/rfc/rfc920.txt> (accessed Feb. 8, 2003).

2. Why are Domain Names Important?

Domain names are important for a variety of reasons. At the most basic level, domain names simply allow applications that use the Internet to address servers (computers or other devices) on the Internet. Most end users[35] are familiar with Hyper Text Transfer Protocol (HTTP),[36] the application behind the World Wide Web.[37] Internet browser programs, such as Internet Explorer, Netscape Communicator, or Opera, typically include an address bar that allows the end user to enter a domain name in order to browse to a particular website—lowering the time (and hence cost) of accessing websites.[38] Another program that uses domain names is Simple Mail Transfer Protocol or SMTP.[39] E-mail programs, such as Outlook or Eudora allow end users to enter an e-mail address consisting of an e-mail identifier, such as "billgates," the "at" symbol, "@," and a domain name, such as "microsoft.com." SMTP uses the domain name in the e-mail address to route the data packets comprising the e-mail message to the appropriate computer (mail server[40]) on the Internet. Domain names are important because they make it easier (and hence less costly) to navigate the Internet.

So far, we have described the technical function provided by domain names. But domain names have acquired another level of importance that goes beyond the ease of use created by this technical function. Because of the World Wide Web, web sites (linked collections of web pages, coded with HTML) are important communication tools with economic significance. A linguistic convention has emerged whereby the domain name associated with the home page of a website becomes the *name* of the site itself. In the case of a dotcom—that is, a company that does business primarily on the Internet—the business itself may be named by the domain name or part of the domain name. The name of the business Amazon.com, Inc., is syntactically identical (minus the "Inc.") to the domain name that resolves to the Internet Protocol Address which serves up the

35. *See supra* n. 16 (defining end users in contrast to information providers).

36. *See* Webopedia, *HTTP* <http://www.webopedia.com/TERM/H/HTTP.html> (Aug. 5, 2002).

37. *See* Webopedia, *World Wide Web* <http://www.webopedia.com/TERM/W/World_Wide_Web.html> (Aug. 5, 2002).

38. *See, e.g.*, Aspira, *Introduction to the Internet* at 4 <http://ctc.aspira.org/PDF%20files/InternetBasics.pdf> (accessed Apr. 20, 2003).

39. *See* Webopedia, *SMTP* <http://www.webopedia.com/TERM/S/SMTP.html> (Feb. 25, 2003).

40. *See* Atis, *Telecom Glossary 2K, Mailserver* <http://www.atis.org/tg2k/_mailserver.html> (accessed Feb. 28, 2003).

Amazon.com website. The first term in the name of the business eBay, Inc., is syntactically identical to the second level domain name ".eBay." Even when a company is not a dotcom, its website may acquire an identity of its own that is significant to the public image of the company. So, the website "sonystyle.com" is an important public face of the enterprise, "Sony, Inc." As is recognized by the institution of trademark law, names can have economic value, because they are associated with goodwill and provide reputation information to consumers about components of value, such as quality and reliability. A large part of the capitalized market value of Amazon.com, Inc. is likely constituted by the good will associated with its domain name.[41]

Thus, domain names have value, both as shortcuts for IP Addresses and as trade names. The value of such addresses gave rise to the practice of cybersquatting or registering a domain name that includes that trademark of an existing commercial enterprise and then attempting to sell that domain name to the enterprise.[42] The practice of cybersquatting, in turn, led to the adoption of a federal statute, the Anticybersquatting Consumer Protection Act (ACPA),[43] and a system of private arbitration policies, including ICANN's Uniform Dispute Resolution Policy (UDRP).[44] The economic value of domain names has also created a secondary market for domain names that are easy to remember or that are intuitively obvious names for particular dotcom businesses. "Car.com" and "auto.com" are obvious candidates for a website that sells a product or service related to automobiles. If the current registrant of the domain name does not have a profitable business associated with the name, the

41. As of Dec. 31, 2002, goodwill was carried on Amazon.com at 70.8 million dollars. *See* Yahoo!, *Yahoo! Finance, multexInvestor, AMZN Balance Sheet* <http://yahoo.multexinvestor.com/IS.aspx?ticker=AMZN&target=%2fstocks%2ffinancial info%2fstatements%2fbalancesheet%2fquarterly> (accessed Nov. 3, 2003). However, the total book value of Amazon.com was 1.99 billion dollars (*see id.)* as compared to a market capitalization of 10.7 billion dollars. *See* Yahoo!, *Yahoo! Finance, Quotes & Info, Profile for Amazon.com Inc.* <http://finance.yahoo.com/q/pr?s=amzn> (accessed Nov. 3, 2003). Market capitalization of Amazon.com exceeds book value by more than 8 billion dollars. Were Amazon.com to lose the rights to the Amazon.com domain name, it seems likely that Amazon's stock price (and hence its market capitalization) would drop significantly. The quantity of the drop, and hence the amount of market capitalization attributable to the domain name, is quite speculative.

42. *See* Webopedia, *Cybersquatting* <http://www.webopedia.com/TERM/c/ cybersquatting.html> (accessed Nov. 3, 2003).

43. Pub. L. No. 106-113, 113 Stat. 1536 (codified as amended at 15 U.S.C. § 1129 (1999), *available at* GigaLaw.com <http://www.gigalaw.com/library/anticybersquattingact-1999-11-29-p1.html> (accessed Nov. 3, 2003).

44. *See* ICANN, *Uniform Domain-Name Dispute-Resolution Policy* <http://www.icann.org/udrp/udrp.htm> (Aug. 26, 2001).

registrant might choose to sell it instead. Until recently, someone who wished to register a domain name like "car" as a second level domain could only do so in one of three unrestricted gTLDs, ".com," ".net," or ".org."[45]

3. How Are Domain Names Created?

A domain name comes into being when it is registered. In order to explain how this happens, we define four key terms:

- **Registrant**: An information provider[46] who registers a domain name. Registrants are customers of registration services.
- **Registrar**: An entity that sells domain name registration service to registrants. Registrars are middle persons or retailers.
- **Registry**: An entity that provides domain name service for a TLD. Registries are the service producers; they deal with the customers through registrars.
- **Domain Name Authority**: An entity that provides root service. The existing Domain Name Authority, ICANN (performing the IANA functions), controls the creation (or elimination) of TLDs and contractually sets policies that govern registrars and registries for most of the gTLDs.[47]

So, if Alice wishes to register the domain name "alice.com," she will enlist the services of a registrar. As the prospective registrant, she might use DirectNIC by browsing to www.directnic.com.[48] Alice will then check to make sure her preferred domain name is available, and if it is, she will be offered the opportunity to register the domain name for a limited period of time, for example, two years, by paying a fee and providing contact information.[49] If Alice completes the

45. The text simplifies somewhat because it ignores the possibility of registering the domain in one of the ccTLDs, such as .uk or .fr. Some of these alternatives were unavailable because the authority responsible for administering the particular ccTLD itself created a restricted set of second level domains. Thus, one might be allowed to register "car.co.uk," but not "car.uk." Other ccTLDs do allow for unrestricted registration of second level domains. For example, the ccTLD for the small nation of Tuvalu, allows unlimited registration of second level domains, but charges a premium price for valuable names such as .car or .auto. Each ccTLD authority sets naming policies for its top level domain.

46. *See supra* n. 16 (defining information providers in contrast to end users).

47. Presumably the United States government retains full control over the .mil and .gov TLDs.

48. *See* <http://www.directnic.com> (accessed Mar. 21, 2003).

49. A registrant's administrative and technical contacts, as well as the IP Address of the web server that hosts the domain (or the name server for the second level domain), is entered into the WhoIs database. This database is publicly accessible, and provides "an important resource to Internet users including registrants, registrars, businesses, ISPs,

transaction, she becomes a domain name registrant, and DirectNIC would be her registrar. The registrar will then provide Alice's information to the registry for the .com domain. Registry service for .com is provided by Verisign, a for-profit corporation headquartered in Virginia. Verisign will then enter the information for alice.com in the database (called a zone file[50]) that comprises the .com registry.

4. How Does the Domain Name System Work?

Up to this point, we have not described the actual operation of the Domain Name System (DNS). How does a user of the Internet get name service? That is, when I enter a domain name in the address bar of my browser, how does that name "resolve" or translate into a particular Internet Protocol Address? We begin with a simplified model of the operation of the DNS; we then provide a more complete description of the actual operation of the system in practice.[51]

A simplified version of the DNS might operate as illustrated in Figure 1. Imagine that Ben, an end user, enters the domain name "www.alice.com" in the address bar of his browser. Suppose Ben is on an Ethernet network (sometimes called a "Local Area Network" or LAN – step 1 in the illustration), and that on Ben's network there is a server that attaches the network to the Internet, usually through an ISP (step 2). The server to which Ben's computer is linked needs to know where Ben's data packets should be routed. The top part of the domain name is .com, so the server on Ben's network needs to know where it should look to find the IP Addresses that are associated with the second level domain names (e.g., Amazon.com, eBay.com) that end in .com. It can find this information by querying a root server, that is, a computer that has the root file—a database of the IP Addresses for the name servers with the zone files for each of the

intellectual property holders, and governmental law enforcement and consumer protection agencies." *See* <http://www.icann.org/riodejaneiro/whois-topic.htm> (Mar. 11, 2003).

50. *See* SearchWebServices.com, *Definitions: zone file* <http://searchwebservices.techtarget.com/sDefinition/0,,sid26_gci811293,00.html> (accessed Apr. 18, 2002); Webhosts4Free, Webhosting Glossary: Zone file <http://www.webhosts4free.com/definitions/zone-file.php> (accessed Mar. 21, 2003); *see also* Requests for Comments: 882 <ftp://ftp.rfc-editor.org/in-notes/rfc882.txt> (accessed Feb. 16, 2003) ("Name servers know the parts of the domain tree for which they have complete information; these parts are called ZONEs.").

51. Throughout the discussion that follows, we will speak of domain names and IP Addresses, rather than Universal Record Locators (URLs) and web addresses. URLs and web addresses are used by the World Wide Web, only one of the many applications that run on the Internet.

TLDs.[52] There are 13 root servers,[53] all of which have "mirror" copies of the root file. The server to which Ben is connected will have a list of the addresses of the root servers.

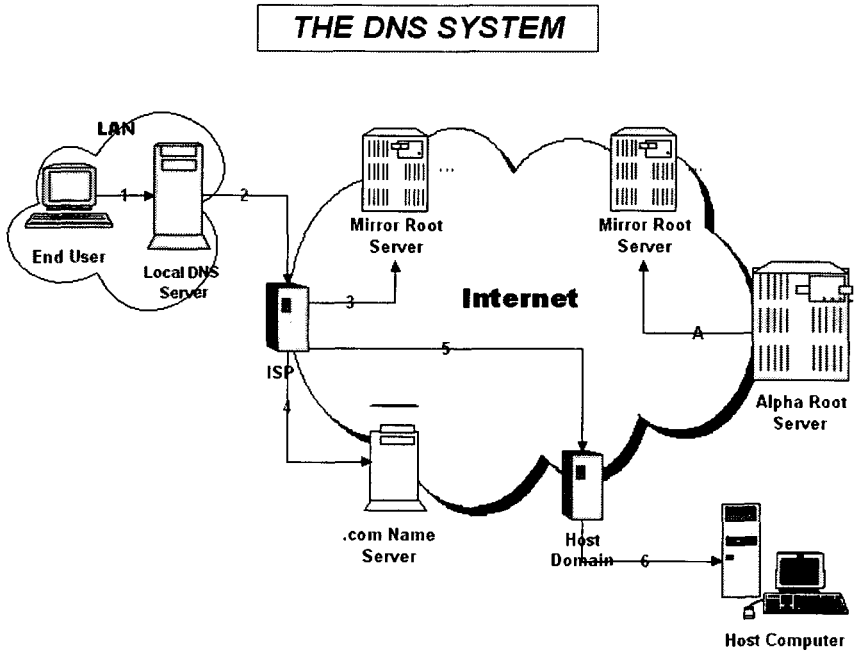

Figure 1

Ben's server will query one of these computers (step 3) and will receive the IP Address of a name server[54] for .com. The name server for .com has the zone file for .com. The zone file is the database that correlates second level domain names in .com with IP addresses.[55] Ben's server will then send a query to that name server (step 4),

52. *See* SearchNetworking.com, *Definitions: Root Server System* <http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci212922,00.html> (Oct. 23, 2002); Webopedia, *Root Server System* <http://www.webopedia.com/TERM/R/root_server_system.html> (June 24, 2002).

53. *See* Root Server Technical Operations Association <http://root-servers.org> (Mar. 6, 2003) (listing 13 root servers, designated a - m).

54. It may be the primary name server (the authoritative name server, for the domain) or it may be a secondary name server that mirrors the zone file on the primary server. *See* Rutgers University, CS352 Fall 2002 DNS Lecture <http://remus.rutgers.edu/cs352/F02/lectures/dns.pdf> (accessed Mar. 21, 2003) (distinguishing primary and secondary name servers). The term "name server" was introduced in Request for Comments 882 <ftp://ftp.rfc-editor.org/in-notes/rfc882.txt> (accessed Feb. 16, 2003).

55. *See supra* n. 50.

which in turn will provide him with the IP Address for alice.com. Ben's computer will then send a query to the host at alice.com (step 5), which will give him the IP Address number for the third level domain, www.alice.com (step 6). (This is likely, but not necessarily, the same computer as alice.com).[56] Ben's server now has the information it needs to make the connection between Ben's computer and the computer that hosts the website for www.alice.com.

The simplified (and counterfactual) story told in the previous two paragraphs will likely strike the reader as involving a substantial amount of inefficiency. The name server for the .com zone is likely to have a stable IP Address—that is, the IP Address associated with the primary and secondary name servers for the zone are not likely to change, or at least, not likely to change very frequently. Ben's server can retain (or cache) that information and automatically send .com inquiries to the proper name server without querying a root server. Likewise, Ben is likely to visit certain websites repeatedly. Why should Ben's network server query the .com name server every time he wants to visit popular websites such as amazon.com or ebay.com? Once again, Ben's server can cache that information. If Ben is attached to a network with many users—for example, the networks that consists of all of Earthlink or AOL's dial-up customers—it might be efficient for the network administrator to provide a copy of the whole .com database locally, refreshing it from time to time.[57] Through caching and propagation of the DNS, the frequency with which Ben's server makes queries to the name servers can be substantially reduced. Ben's server will not query the root unless Ben

56. Because the World Wide Web is only one application that uses the Internet, it is possible that no web page is associated with alice.com. As of this writing, the World Wide Web had become such a common application, that most network administrators would establish a web page addressed by a given second level domain name. *See* searchWebServices.com, *Definitions: Zone File* <http://searchwebservices.techtarget.com/sDefinition/0,,sid26_gci811293,00.html> (Apr. 18, 2002) (stating "a Web zone file should allow resolution of domains either with or without the three letters www").

57. The .com zone file is evidently no longer available without a showing of need, because of abuse. *See* Posting of Cricket Liu, cricket@acmebw.com, to binds-users@isc.org <http://www.isc.org/ml-archives/bind-users/1999/01/msg00109.html> (Jan. 26, 1999). Verisign now accepts applications for the .com zone file access program. *See* Global Registry Services, *TLD Zone File Access Program* <http://verisign-grs.com/tld/> (accessed Mar. 21, 2003). Verisign provides access to other TLD zone files under the same program, but does not provide access to .org. *See* Global Registry Services, *Announcement: Important Notice Regarding TLD Zone Access and the Transition of .ORG TLD* <http://verisign-grs.com/tld/announce_121002.html> (Dec. 10, 2002). The .org zone file is managed by Public Internet Registry. *See* The .ORG Transition, *.ORG Zone File Agreement* <http://www.orgtransition.info/zone_file> (accessed Mar. 21, 2003); *see also* Public Interest Registry, *Home* <http://www.pir.org> (accessed Mar. 21, 2003).

enters a domain name that includes a TLD that is not cached locally or for which the cached address is no longer accurate: we say that the name does not "resolve." If Ben enters a second-level domain name for the .com TLD that is not cached on Ben's server, then his server will need to query the .com name server.

In sum, the information that enables the DNS to function is distributed via caching, and the name servers and root servers are only queried when local network servers are unable to "resolve" a domain name. Most domain names will resolve without any need to query the root. Many domain names will resolve without any need to query the name server for the TLD in which the domain is located. The hierarchical nature of the domain name system makes resolution of names into IP Addresses fairly efficient, thereby minimizing addressing overhead.

B. Management of the Domain Name and Root Server Systems

In this section, we describe the system by which the domain name system and the associate root servers are managed. We begin with ICANN,[58] which has primary responsibility for overall management of the DNS; we then discuss the cooperative system for management of the root servers.[59]

1. The Early History of the Domain Name System

Someone must administer and coordinate the addressing system for the Internet. Early in the history of the Internet,[60] each host had both a name and address.[61] Every host had its own copy of the table or database that correlated names and addresses.[62] The Network Information Center (NIC)[63] at SRI[64] operated the first name server, beginning in July of 1982.[65] This early incarnation of the name system

58. *See infra* pt. I(B)(2) (The Internet Corporation for Assigned Names and Numbers).

59. *See infra* pt. I(B)(3) (The Root Servers).

60. *See generally* Jean Abate, *Inventing the Internet* (Massachusetts Institute of Technology 1999); Katie Hafner & Matthew Lyon, *Where Wizards Stay up Late: The Origins of the Internet* (Simon & Schuster 1996).

61. Credit for the idea of naming hosts has been given to Peggy Karp who conceived of "host mnemonics." *See* Ross Wm. Rader, Web Hosting Magazine, *Alphabet Soup: The History of the DNS*, <http://www.whmag.com/content/0601/dns/index.asp> (June 2001).

62. *See* Abate, *Inventing the Internet*, *supra* n. 60, at 188-89.

63. *See id.* at 59, 86-87.

64. *See* SRI International<http://www.sri.com> (accessed Mar. 21, 2003).

65. *See* Abate, *Inventing the Internet*, *supra* n. 60, at 141, 189.

lacked domains, and as the Internet grew, the lack of coordination gave rise to problems. Craig Partridge[66] is quoted as saying:

> When we started to get about two thousand hosts, that's when things really began to come apart. Instead of having one big mainframe with twenty thousand people on it, suddenly we were getting inundated with individual machines, and everyone wanted [their host] to be named Frodo.[67]

The perceived inadequacy of the name system operated by NIC lead to the development of a new system, called the Domain Name System (DNS).[68] A new approach was suggested by David Mills.[69] Further discussion came from Jon Postel and Zaw-Sing Su[70] and from Paul Mockapetris.[71] The new DNS was adopted in the mid 1980s.[72] The goal of the DNS was to distribute the task of maintaining the tables that correlated names and numbers. Each domain would have its own name server, which would maintain the necessary database (zone file) for its domain. When one host needed to resolve the name of another, it would query the name server for the appropriate domain.[73]

In 1991, Network Solutions Inc. (NSI) began a process that led to its assumption of operational responsibility for the new DNS.[74] Also, in the early 1990s, the University of Southern California's Information Science Institute (ISI) received a contract to perform the management functions for the DNS, as what is called the Internet

66. Dr. Craig Partridge is the Chief Scientist at BBN technologies. *See* BBN Technologies, *Dr. Craig Partridge* <http://www.ir.bbn.com/~craig/> (accessed February 7, 2004).

67. *See* Hafner & Lyon, *Where Wizards Stay up Late: The Origins of the Internet*, *supra* n. 60, at 252.

68. *See* Rader, *Alphabet Soup: The History of the DNS*, *supra* n. 61 (stating that scalability problems led to changes in the naming system).

69. *See* Request for Comments: 799<ftp://ftp.rfc-editor.org/in-notes/rfc799.txt> (accessed Feb. 16, 2003); Rader, *Alphabet Soup: The History of the DNS, supra* n. 61.

70. *See* Request for Comments: 819 <ftp://ftp.rfc-editor.org/in-notes/rfc819.txt> (accessed Feb. 16, 2003); Rader, *Alphabet Soup: The History of the DNS, supra* n. 61.

71. *See* Request for Comments: 882 <ftp://ftp.rfc-editor.org/in-notes/rfc882.txt> (accessed Feb. 16, 2003); Request for Comments: 883 <ftp://ftp.rfc-editor.org/in-notes/rfc883.txt> (accessed Feb. 16, 2003); *see also* Rader, *Alphabet Soup: The History of the DNS*, *supra* n. 61.

72. *See* Requests for Comments: 881 <ftp://ftp.rfc-editor.org/in-notes/rfc881.txt> (accessed Feb. 16, 2003); Requests for Comments: 920 <ftp://ftp.rfc-editor.org/in-notes/rfc920.txt > (accessed Feb. 16, 2003); Rader, *Alphabet Soup: The History of the DNS, supra* n. 61.

73. *See* Abate, *Inventing the Internet, supra* n. 60, at 189-190.

74. *See* Rader, *Alphabet Soup: The History of the DNS, supra* n. 61.

Authority for Names and Addresses (IANA).[75] In reality, this formal relationship represented Jon Postel's historical role in performing a variety of functions. It might be more accurate to say that Postel was the IANA.[76]

2. The Internet Corporation for Assigned Names and Numbers

By 1995, Postel had begun to circulate proposals for a new structure for managing the DNS.[77] Postel proposed that a new entity might be created to perform these functions.[78] Responsibility within the United States Government for the Internet eventually came to rest with the Department of Commerce (DOC), and hence that agency was involved in the process that led to the creation of ICANN in 1998. The precise nature of the relationship between DOC and ICANN is murky at the level of legal theory,[79] but whatever that relationship may be, it is formally embodied in a document called a Memorandum of Understanding (MOU).[80]

In general, the MOU states that ICANN and DOC "will jointly design, develop, and test the mechanisms, methods, and procedures that should be in place and the steps necessary to transition

75. *See* Posting of Craig Partridge, craig@aland.bbn.com <http://www.postel.org/pipermail/internet-history/2002-March/000080.html> (Mar. 20, 2002); Posting by Rahmat M. Samik-Ibrahim, rms46@vlsm.org, <http://www.postel.org/pipermail/internet-history/2002-March/000077.html> (Mar. 19, 2002). The first mention of the IANA acronym in the Requests for Comments is RFC 1174, issued in 1990 by Vint Cerf. *See* Request for Comments: 1174 <ftp://ftp.rfc-editor.org/in-notes/rfc1174.txt> (accessed February 16, 2003). Most queries yield negative results, giving rise to the inference that most queries are a result of misspellings. *See* AS112 Project Home Page<http://as112.net> (Mar. 16, 2003).

76. *See* Posting by Rahmat M. Samik-Ibrahim, rms46@vlsm.org <http://www.postel.org/pipermail/internet-history/2002-March/000079.html> (Mar. 20, 2002); Request for Comments: 2468 <http://www.rfc-editor.org/rfc/rfc2468.txt> (updated Feb. 16, 2003). Postel began to perform these functions early in the history of the Internet. *See, e.g.*, Request for Comments: 204 <http://www.rfc-editor.org/rfc/rfc204.txt> (accessed Feb. 16, 2003) (showing that Postel had responsibility for socket numbers, i.e. port assignments, as early as 1971).

77. *See* B. Carpenter et al., *Proposal for an ISOC Rule in the DNS Name Space Management* <http://dns.vrx.net/news/by_date/old/1995/Nov/isocrfc.html> (Nov. 1995).

78. The entity was initially called "Newco." *See* Michael E. Heltzer, Government Relations Program Coordinator, letter to Joe Sims, Jones, Day, Reavis & Pogue <http://www.iana.org/comments/29aug1998-04sep1998/msg00054.html> (Sept. 4, 1998); Rader, *Alphabet Soup: The History of the DNS, supra* n. 61, at 6.

79. *See* A. Michael Froomkin, *Wrong Turn in Cyberspace: Using ICANN to Route Around the APA and the Constitution*, 50 DUKE L.J. 17, 34-36, 50-51 (Oct. 2000).

80. *See* ICANN, *Memorandum of Understanding Between the U.S. Department of Commerce and Internet Corporation for Assigned Names and Numbers* <http://www.icann.org/general/icann-mou-25nov98.htm> (Dec. 31, 1999).

management responsibility for DNS functions now performed by, or on behalf of, the U.S. Government to a private-sector not-for-profit entity."[81] In particular, the MOU charters ICANN with responsibility for five tasks:

a. Establishment of policy for and direction of the allocation of IP number blocks;
b. Oversight of the operation of the authoritative root server system;[82]
c. Oversight of the policy for determining the circumstances under which new top level domains would be added to the root system;
d. Coordination of the assignment of other Internet technical parameters as needed to maintain universal connectivity on the Internet; and
e. Other activities necessary to coordinate the specified DNS management functions, as agreed by the Parties.[83]

The agreement further specifies a set of principles, including: (1) the importance of the stable function of the Internet; (2) the promotion of competition in the provision of DNS services; (3) the use of private sector, bottom-up policy formation; and (4) representation of Internet users, both in the U.S. and internationally.[84]

ICANN has an organizational structure that is almost baroque in its complexity. There is a President and Board of Directors. In addition, there are three Supporting Organizations, each of which corresponds to one of ICANN's primary areas of responsibility. The Address Supporting Organization (ASO) is responsible for developing bottom-up policy recommendations for the IP addressing system. The Country Code Names Supporting Organization (CCNSO) has a similar responsibility for the ccTLDs, as does the Generic Names Supporting Organization (GNSO) for the gTLDs. Each of the Supporting Organizations is further substructured into

81. *Id.*

82. The "'Authoritative Root-Server System' means the constellation of DNS root-nameservers specified, from time to time, in the file <ftp://ftp.internic.net/domain/named.root>." *See* ICANN, *.net Registry Agreement* <http://www.icann.org/tlds/agreements/verisign/registry-agmt-net-25may01.htm> (May 25, 2001).

83. *Id.*

84. *Id.*

Constituencies. For example, the GNSO has a Business Users Constituency and an Intellectual Property Constituency.[85]

The Board's selection is even more complex, and the current scheme reflects the enormous controversy generated by ICANN's abortive attempt to select half of its Board through an international election in which the franchise was extended to all of the world's Internet users.[86] Here is an outline of the current plan:

- The current scheme provides a total of 15 Board Members.
- Eight members of the Board are now selected by a Nominating Committee.
- Each of the Supporting Organizations (ASO, CCNSO, and GNSO) selects two Board Members (for a total of six).
- The President, who is selected by the Board, is the final Member.[87]
- The Nominating Committee (NOMCOM), which selects a majority of the Board, itself has a complex structure.[88]

ICANN's complex organizational structure reflects the constellation of interests affected by domain name policy. Registries and registrars for the gTLDs have a direct economic stake in domain name policy, as do the operators of the ccTLDs. Because of the phenomenon of cybersquatting, the owners of trademarks also have a

85. *See* ICANN, *Bylaws for Internet Corporation for Assigned Names and Numbers* <http://www.icann.org/general/bylaws.htm#1> (Dec. 5, 2003).

86. *See* M. Stuart Lynn, *President's Report: ICANN - The Case for Reform* <http://www.icann.org/general/lynn-reform-proposal-24feb02.htm> (Feb. 24, 2002) ("Three years of effort have proven that a global online election of ICANN Board members by an entirely unknown and self-selected membership is not a workable solution to this problem.").

87. ICANN *Bylaws*, *supra* n. 85, Art. VI, Section 2.

88. The Nominating Committee is composed of various non-voting members and 17 voting members. Five of these are selected by an At-Large Advisory Committee, two are selected by the Business users constituency of the GNSO, and 10 are selected, one each by (i) the gTLD Registry Constituency of the Generic Names Supporting Organization, (ii) the gTLD Registrars Constituency of the Generic Names Supporting Organization, (iii), the Council of the Country Code Names Supporting Organization, (iv) the Internet Service Providers Constituency of the Generic Names Supporting Organization, (v) the Intellectual Property Constituency of the Generic Names Supporting Organization, (vi) the Council of the Address Supporting Organization established, (vii) an entity designated by the Board to represent academic and similar organizations, (viii) consumer and civil society groups, selected by the Non-commercial Users Constituency of the Generic Names Supporting Organization, (ix) the Internet Engineering Task Force, and (x) the ICANN Technical Liaison Group. *See Id.* One of the authors of this Article, Lawrence Solum, has described the election process as follows: "everyone seems to elect everyone else in an Ourobus Worm of interlocking Supporting Organizations, Nominating Committee, and Board." Lawrence Solum, *Blogging from Brazil 7* <http://lsolum.blogspot.com/2003_03_01_lsolum_archive.html#200053016> (Mar. 27, 2003).

significant economic stake. Internet Service Providers (ISPs) and network administrators also have interests that are affected by ICANN. This first group of stakeholders has direct interests in the DNS; they have powerful economic incentives to participate in the ICANN process and to attempt to influence the decisions that ICANN makes in a way that favors their interests.

Of course, domain name policy also affects information providers and end users of the Internet.[89] In some cases, these interests are substantial. There are some enterprises and individuals with large inventories of registered domain names. For most registrants and end users, however, their individual economic stake in domain name policy is *de minimis*. This creates what economists call a collective action problem:[90] it simply isn't worthwhile for either information providers who are merely individual registrants or end users of the Internet to participate in the bottom-up ICANN process.[91]

Given the focused interests of direct stakeholders on the one hand and the diffuse interests of the end users and individual domain

89. *Id.*

90. *See* Mancur Olson Jr., *The Logic of Collective Action* (Harvard University Press 1965).

91. Collective action problems can be overcome. For example, if members of a group perceive that other members are cooperating, cooperation may become established as a norm. *See, e.g.*, Dan M. Kahan, *The Logic of Reciprocity: Trust, Collective Action, and Law* <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=361400> (accessed Mar. 22, 2003). In the case of ICANN's bottom-up, consensus driven policy process, norms of cooperation have emerged among those who are stakeholders in the ICANN process. Thus, many participants in the ICANN process invest significant amounts of time and energy for no material reward. Because these stakeholders are members of identifiable communities and interact on a regular basis, they are able to form communities that overcome the free rider problems that the bottom-up model faces. To some extent, the free rider problems are diminished because some participants in the ICANN process are subsidized by their employers. The firms that subsidize participation in the ICANN process may or may not fully understand that, as a firm, free riding with respect to ICANN is a profit-maximizing option. When it comes to individuals who own individual domain names or who simply use the DNS, it is quite clear that collective action problems are real and create a substantial barrier to the effective participation of these groups in the bottom-up, consensus driven ICANN process. If such an individual were to sign on to one of the many mailing lists of the various ICANN groups, for example, they would encounter a large volume of e-mail activity. Some of the e-mail groups have conflicts that escalate into so-called flame wars. Physical attendance at the far-flung meetings of ICANN is expensive. For example, the last several ICANN meetings have been held in Carthage (Tunisia), Montreal (Canada), Rio de Janeiro (Brazil), Amsterdam (Netherlands), Shanghai (China), Bucharest (Romania), Accra (Ghana), Marina Del Rey (California), and Montevideo (Uruguay). *See* ICANN, *Calendar of Events* <http://www.icann.org/
calendar.htm> (Mar. 20, 2003).

name registrants on the other hand, public choice theory predicts that the outcome of a bottom-up consensus driven process will be policies that favor the direct stakeholders.[92] ICANN attempts to compensate for this tilt in a variety of ways. One strategy, the direct election of representatives for the public in worldwide elections, was unsuccessful.[93] The current strategy has four elements. First, ICANN has created an At-Large Advisory council—without formal decision making power, but with a charge to represent the public interest.[94] Second, consumer groups have representation on the NOMCOM.[95] Third, the Non-commercial Users Constituency of the Generic Names Supporting Organization also serves as a proxy for the interests of the public at large. Fourth, and perhaps most importantly, the collective action problem—for individual registrants, end-users, and the public at large—creates an important role for the ICANN Board. The Board's obligation to act in the public interest requires the Board to make an independent evaluation of the results of ICANN consensus-driven, bottom-up process. If the process has been dominated by stakeholders, it is the role of the board to insure that the pubic interest is fairly reflected in ICANN policy.[96]

ICANN's organizational culture also reflects a consensus-based model of decision making.[97] This model creates opportunities for strategic action to block changes in the domain name system. To the extent that the creation of new gTLDs, for example, might injure the interests of some stakeholders (e.g., Verisign, which has an economic stake in the .com gTLD, or trademark owners who would prefer to limit the opportunities for cybersquatting), it is predictable that those interests will be able to block or delay changes in policy—given the requirement that policymaking be based on consensus. In such cases, action by the Board of Directors, despite the lack of true consensus

92. Dennis C. Mueller, *Public Choice II*, 229-246 (Cambridge Univ. Press 1989).

93. *See* Lynn, *President's Report: ICANN – The Case for Reform, supra* n. 86.

94. *See* ICANN, *At-Large Advisory Committee* <http://www.icann.org/committees/alac/> (Feb. 25, 2003) (discussing ALAC in general and providing a link to the By-Laws enacting ALAC).

95. *See* Solum, *Blogging from Brazil 7, supra* n. 88 (noting that members of the NOMCOM are designated by an entity designated by the Board to represent academic and similar organizations and by consumer and civil society groups, selected by the Non-commercial Users Constituency of the Generic Names Supporting Organization).

96. *See infra* pt. IV(C)(1) (ICANN's Mandate to Serve the Public Interest).

97. *See generally* Michael Froomkin, *Habermas@discourse.net: Toward a Critical Theory of Cyberspace*, 116 HARV. L. REV. 749 (2003) (describing and criticizing ICANN's consensus-based decision making process). An online version is available at <http://www.law.miami.edu/~froomkin/discourse/ils.pdf> (accessed Mar. 15, 2003).

among the ICANN community, will be required if ICANN is to act in the public interest.

3. The Root Servers

The root server system provides the physical infrastructure that allows the root to function.[98] Recall that the root consists of servers and files that contain the addresses of the various TLD name servers (which in turn hold the zone files for their respective TLDs). The various root servers are operated by several different entities, including Verisign, ICANN, and various agencies and organizations that are part of the United States Government. Root servers are located in the United States (10), the United Kingdom (1), Japan (1), and Sweden (1).[99] Although Request for Comments[100] 2870 states "The Internet Corporation for Assigned Names and Numbers (ICANN) has become responsible for the operation of the root servers,"[101] the reality is perhaps more complicated. Some of the root server operators have not signed formal agreements with ICANN,[102]

98. *See* Webopedia, *Root Server System* <http://www.webopedia.com/TERM/R/root_server_system.html> (June 24, 2002). The Root Server Technical Operations Association maintains a website at <http://root-servers.org> (Mar. 6, 2003). ICANN has a DNS Root Server System Advisory Committee. *See* ICANN, *DNS Root Server System Advisory Committee* <http://www.icann.org/committees/dns-root/> (Nov. 15, 2002). The root server system is discussed in Requests for Comments 2870. *See* Network Working Group, *Requests for Comments: 2870* <http://www.icann.org/committees/dns-root/rfc2870.txt> (accessed Feb 16, 2003).

99. *See* Root Server Technical Operations Association, *Root Server Technical Operations Association Home* <http://root-servers.org> (Mar. 6, 2003).

100. A Request for Comments (RFC) is the typical method for providing information and soliciting public input on matters relating to the Internet. *See* RFC Editor <http://rfc-editor.org> (Mar. 10, 2003). The RFC series was started by Jon Postel in 1969 as a "set of technical and organizational notes about the Internet." *See* Request for Comments: 2555 <ftp://ftp.rfc-editor.org/in-notes/rfc2555.txt> (Apr. 6, 1999). For instance, Postel issued RFC 1591 (Mar. 1994) seeking comments on "Domain Name System Structure and Delegation." For a revealing discussing of the RFCs and the role they played in the early emergence of Internet standards, see Froomkin, *Habermas@discourse.net: Toward a Critical Theory of Cyberspace, supra* n. 97, at 784 (recounting origins of RFCs).

Requests for Comments are also issued by federal agencies, often as part of the rule-making process. For instance, the Department of Commerce issued an RFC on July 1, 1997, seeking public comments "on the Registration and Administration of Internet Domain Names." *See* Request for Comments on Internet Domain Names <http://www.ntia.doc.gov/ntiahome/domainname/dn5notic.htm> (July 1, 1999). Responses to this RFC lead to the formulation of the "green" and "white" papers discussed *infra*, n. 213. DOC RFCs use a different nomenclature; they are designated by docket number (e.g., Docket No. 970613137-7137-01 for the July 1, 1997 document mentioned here).

101. Request for Comments: 2870 <http://www.rfc-editor.org/rfc/rfc2870.txt> (accessed Feb. 16, 2003).

and for this reason, ICANN's formal authority over the root server system is unclear.

Perhaps the best way to view the current root system is as a voluntary system of cooperation between the United States Government, ICANN, and the operators of the nongovernmental root servers—with other entities entering and exiting the system of cooperation on particular occasions. Although ICANN plays the lead role in the coordination of DNS policy, the root operators themselves appear to work out technical issues without direct intervention from ICANN. The Internet Engineering Task Force (IETF) also plays a technical role.[103] Although authority over the root system is in some ways murky, as a practical matter the root is responsive to policy decisions made by ICANN. Even though "ICANN is not, and should not become, the 'government of the Internet,'"[104] in many respects it acts as regulator. This is nowhere more apparent than in developing policy for generic top level domains.

C. Generic Top Level Domains

We begin our discussion of the gTLDs by placing them in the context of the whole TLD name space. The TLDs are grouped into three categories: (1) generic, (2) country code, and (3) infrastructure. Although our primary focus is on gTLD policy, we pause for a moment to discuss the other two categories.

102. *Cf.* ICANN, *DNS Root Server System Advisory Committee* <http://www.icann.org/committees/dns-root/> (Nov. 15, 2002) ("Work is proceeding on defining appropriate agreements and technical measures to operate the root nameserver system according to the guidance in RFC 2870. These requirements will be incorporated in a memorandum of understanding between each operator and ICANN. A model of the MoU has been developed."); ICANN, Model MoU for Root Nameserver Operations <http://www.icann.org/committees/dns-root/model-root-server-mou-21jan02.htm> (Jan. 21, 2002).

103. *See* IETF, *Domain Name System Operations* (dnsop) <http://www.ietf.org/html.charters/dnsop-charter.html> (Mar. 21, 2003).

104. *See On ICANN Governance*, Testimony of Nancy J. Victory, Assistant Secretary for Communications and Information, National Telecommunications and Information Administration, United States Dept. of Commerce, before the Subcommittee on Science, Technology and Space, Committee on Commerce, Science, and Transportation, United States Senate, June 12, 2002, available at <http://www.ogc.doc.gov/ogc/legreg/testimon/107s/victory0612.htm> (accessed Jan. 4, 2003).

1. Country Code and Infrastructure TLDs

Culturally and economically, the most significant competitors to the gTLDs are the ccTLDs.[105] Each ccTLD consists of two letters (.uk, .nz, .fr, etc.). The two letter codes are called "country codes" because they correspond to the two-letter abbreviations for countries (such as .dk for Denmark) or external territories (such as .gl for Greenland) that are included on the International Standards Organization's list of standardized abbreviations.[106] The ccTLD for the United States is .us and, compared to the gTLDs such as .com, .us lacks substantial cultural and economic significance. In this respect, however, the United States may not be typical. In many other nations, the national ccTLD demarcates the name space that is most significant to that nation's end users of the Internet. In the United Kingdom, for example, the .uk name space dominates e-commerce. The UK version of Amazon.com is www.amazon.co.uk.[107] In the United Kingdom, as an example, second level domains operate in a fashion similar to the gTLDs. For example, co.uk is analogous to .com, and .ac.uk is the counterpart of .edu. This is not to say that the gTLDs lack significance outside of the United States. For example, many international firms use their .com address as the worldwide gateway to their various national sites. So, for example, one can browse from www.nikon.com[108] to www.nikon.fr[109] or from www.sony.com[110] to www.sony.co.jp.[111]

105. Discussion of the relationship between ICANN and the ccTLD operators is outside the scope of this essay. A sense of the controversies and conflicts can be gleaned from Jim Wagner's article, ISP News, *ICANN Pretends to Solve ccTLD Problem* <http://www.isp-planet.com/news/2002/icann_020304.html> (Mar. 4, 2002), and Peter K. Yu, *The Neverending ccTLD Story* <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=388980> (accessed Oct. 2, 2003).

106. *See* ICANN, *March 2000 ICANN Meeting in Cairo: ccTLD Delegation and Administration Policies* <http://www.icann.org/cairo2000/cctld-topic.htm> (Feb. 16, 2003). This list, maintained by the International Standards Organization, is called the "ISO 3166-1 list" and it contained 239 entries as of 2001. *See* Deutsches Institut fuer Normung, e.v., *English Country Names and Code Elements* <http://www.din.de/gremien/nas/nabd/iso3166ma/codlstp1/en_listp1.html> (accessed Mar. 22, 2003). Policy for the ccTLDs is summarized in a document denominated "Internet Coordination Policy 1" or "ICP-1." *See* ICANN, *ICP-1: Internet Domain Name System Structure and Delegation (ccTLD Administration and Delegation)* <http://www.icann.org/icp/icp-1.htm> (May 7, 1999); *see also* Request for Comments: 1591, *Domain Name System Structure and Delegation* <http://www.isi.edu/in-notes/rfc1591.txt> (accessed Feb. 8, 2003); IANA, *CCTLD News Memo #1* <http://www.iana.org/cctld/cctld-news1.htm> (Oct. 23, 1997). A list of current ccTLD domains can be found at: IANA, *Root-Zone Whois Information: Index by TLD Code* <http://www.iana.org/cctld/cctld-whois.htm> (Nov. 26, 2001).

107. *See* Amazon, *Amazon Home* <http://www.amazon.co.uk> (accessed Jan. 3, 2003).

108. *See* Nikon, *Nikon Home* <http://www.nikon.com> (accessed Jan. 3, 2003).

The third category of TLDs, the infrastructure domains, includes only one member, the .arpa TLD, briefly discussed in the accompanying note.[112] The .arpa domain supports technical Internet functions, facilitating the retrieval of key data records used by the infrastructure of the Internet.[113] Following the abbreviation convention for the other TLDs, we might call .arpa an iTLD (or perhaps *the* iTLD).[114]

2. The Generic TLDs

We now turn to the generic Top Level Domains. We begin by simply listing and describing the fourteen gTLDs that exist as of this writing. For each gTLD, we indicate whether registration is restricted (to some group) or unrestricted (open to all who pay a fee) and the associated operator or sponsor.

1. **.aero**—restricted to members of the air-transport industry and sponsored by Société Internationale de Télécommunications Aéronautique S.C. (SITA SC).[115]
2. **.biz**—restricted to businesses and operated by NeuLevel, Inc.[116]
3. **.com**—unrestricted and operated by Verisign, Inc.[117]

109. *See* Nikon, *Nikon Home* <http://www.nikon.fr/Nikon_Web/site.nsf/noflash.htm> (accessed Feb. 8, 2003).

110. *See* Sony, *Sony Home* <http://www.sony.com> (accessed Jan. 3, 2003).

111. *See* Sony Japan, *Sony Home* <http://www.sony.co.jp> (accessed Jan. 3, 2003).

112. "The .arpa domain is the **A**ddress and **R**outing **P**arameter **A**rea domain and is designated to be used exclusively for Internet-infrastructure purposes." IANA, *Infrastructure Top-Level Domain* <http://www.iana.org/arpa-dom/> (Jan. 25, 2003).

113. *See* Request for Comments 3172: *Management Guidelines & Operational Requirements for the Address and Routing Parameter Area Domain ("arpa")* <http://www.rfc-editor.org/rfc/rfc3172.txt > (accessed Feb. 8, 2003).

114. Because the iTLD .arpa is of interest to technical aspects of Internet policy it is rarely discussed. The abbreviation "iTLD" has also been used to designate International Top Level Domain, but this usage, intended to contrast with the ccTLDs, has been discontinued in favor of generic Top Level Domain. *See* International Ad Hoc Committee, *Final Report of the International Ad Hoc Committee: Recommendations for Administration and Management of gTLDs* <http://www.iahc.org/draft-iahc-recommend-00.html> (Feb. 4, 1997) (stating "TLDs .com, .org, and .net are currently referred to as 'international' but are more appropriately called 'generic' (gTLDs)").

115. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .aero—Top-Level Domain* <http://www.iana.org/root-whois/aero.htm> (Sept. 29, 2003); .aero, The Domain of Aviation, *All You Need to Know About the .aero Domain* <http://www.nic.aero/> (accessed Mar. 12, 2003).

116. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .biz—Top-Level Domain* <http://www.iana.org/root-whois/biz.htm> (Oct. 5, 2003); .BIZ: *The Internet's New Home for Business* <http://www.neulevel.biz> (accessed Mar. 12, 2003).

4. **.coop**—restricted to cooperative associations and sponsored by Dot Cooperation LLC.[118]
5. **.edu**—restricted to degree-granting educational institutions of higher education that are accredited by one of the six U.S. regional accrediting agencies and operated by Educause.[119]
6. **.gov**—restricted to use by the Government of the United States of America and operated by the US General Services Administration.[120]
7. **.info**—unrestricted and operated by Afilias, Inc.[121]
8. **.int**—restricted to organizations established by international treaties between governments and operated by ICANN.[122]
9. **.mil**—restricted to use by the armed forces of the United States of America and operated by the Department of Defense Information Center.[123]
10. **.museum**—restricted to use by museums and sponsored by the Museum Domain Management Association.[124]

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117. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .com—Top-Level Domain* <http://www.iana.org/root-whois/com.htm> (Jan 29, 2003); Verisign, *Naming and Directory Services* <http://www.verisign.com/nds/naming> (accessed Mar. 12, 2003).

118. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .coop—Top-Level Domain* <http://www.iana.org/root-whois/coop.htm> (Oct. 5, 2003); .COOP, One member. One vote. One Domain. <http://www.cooperative.org> (accessed Mar. 12,, 2003).

119. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .edu—Top-Level Domain* <http://www.iana.org/root-whois/edu.htm> (Oct. 5, 2003); Educause, *.edu Administration* <http://www.educause.edu/edudomain/> (accessed Mar. 12, 2003).

120. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .gov—Top-Level Domain* <http://www.iana.org/root-whois/gov.htm> (Oct. 16, 2003); GSA Federal Technology Service, *Government Domain Registration and Services* <http://www.nic.gov/> (accessed Oct. 5, 2003).

121. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .info—Top-Level Domain* <http://www.iana.org/root-whois/info.htm> (Feb. 27, 2003); Afilias, *Global Registry Services* <http://www.afilias.info/gateway/index_html > (June 27, 2003).

122. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .int—Top-Level Domain* <http://www.iana.org/root-whois/int.htm> (last updatedOct.5, 2003); Internet Assigned Numbers Authority, *The .int Domain* <http://www.iana .org/int-dom/> (Nov. 28, 2002).

123. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .mil—Top-Level Domain* <http://www.iana.org/root-whois/mil.htm> (Oct. 5, 2003); Defense Information Systems Agency, *Defense Network Information Center* <http://www.nic.mil/> (accessed Mar. 12, 2003).

124. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .museum—Top-Level Domain* <http://www.iana.org/root-whois/museum.htm> (Oct. 16, 2003); MuseDoma, *Welcome to MuseDoma* <http://musedoma.museum/> (Oct. 24, 2003).

11. **.name**—restricted to use by individuals and operated by Global Name Registry, Ltd.[125]
12. **.net**—unrestricted and operated by Verisign, Inc.[126]
13. **.org**—unrestricted[127] and operated by Public Internet Registry.[128]
14. **.pro**—restricted to accredited professionals and operated by RegistryPro,[129] but not yet operational as of this writing.[130]

The fourteen gTLDs can be categorized in a variety of ways. We can begin with history, distinguishing the gTLDs by historical period. The .com, .edu, .gov, .int, .mil, .net, and .org belong to what might be called the first wave of gTLDs.[131] Three of these (.edu, .gov, and .mil) reflect the original tilt of the Internet toward the United States, where the Internet originated. The .edu TLD is limited to accredited U.S. educational institutions, and .gov and .mil are reserved for the use of the government and armed forces of the U.S. The .int TLD is used only by International Organizations (IOs) established by treaty. For the purposes of our analysis, we will set these four TLDs aside.

The remaining three members of the first wave of gTLDs are .com, .net., and .org. These domains are currently unrestricted. Anyone can register any combination of Roman letters and Arabic numerals in these domains—although there are legal restrictions on the registration of domain names that are identical or substantially

125. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .name—Top-Level Domain* <http://www.iana.org/root-whois/name.htm> (Oct. 16, 2003);

126. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .net—Top-Level Domain* <http://www.iana.org/root-whois/net.htm> (Oct. 16, 2003); Verisign, *Naming and Directory Services* <http://www.verisign-grs.com> (accessed Mar. 12, 2003).

127. The .org TLD was originally intended for noncommercial entities, but is, in fact, open to registrations by commercial for-profit enterprises, governments, individuals, and so forth. *See* Internet Assigned Numbers Authority, *Generic Top-Level Domains* <http://www.iana.org/gtld/gtld.htm> (Feb. 7, 2003).

128. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .org—Top-Level Domain* <http://www.iana.org/root-whois/org.htm> (Feb. 18, 2003); Public Interest Registry, *Home* <http://www.pir.org> (accessed Mar. 12, 2003).

129. *See* Internet Assigned Numbers Authority, *Root-Zone Whois Information: .pro—Top-Level Domain* <http://www.iana.org/root-whois/pro.htm> (Oct. 16, 2003); RegistryPro <http://www.nic.pro/> (accessed Oct. 24, 2003).

130. *See* Internet Assigned Numbers Authority, *Generic Top-Level Domains* <http://www.iana.org/gtld/gtld.htm> (Feb. 7, 2003) (stating that .pro is being established).

131. Jon Postel proposed the establishment of .gov, .edu, .com, .mil, and .org in RFC-920. *See* Request for Comments: 920, *Domain Requirements* <http://www.rfc-editor.org/rfc/rfc920.txt> (accessed Feb. 8, 2003); *see also* Abate, *Inventing the Internet, supra* n. 60, at 190.

similar to trademarks.[132] For these unrestricted gTLDs, the domain name space was allocated by a rule of first occupation. The first person to register the second level domain name car.com was contractually granted the right to renew that registration. At some point, many persons began to realize that domain names could have significant economic value, and there was a "land rush" for the easy-to-remember domain names that could be used for e-commerce, advertising, or other economic activity.

ICANN's creation was at least in part due to dissatisfaction with the domain name system. Although the primary focus of the grumbling was on the monopoly position held by Network Solutions, Inc. (NSI)—which later was acquired by Verisign—the constricted number of gTLDs was also of concern. In response to these concerns, ICANN initiated a process in the fall of 2000, which led to the creation of seven new gTLDs: .aero, .biz, .coop, .info, .museum, .name, and .pro. In theory, ICANN could have opened the domain name space in a variety of ways. ICANN could have chosen an auction, a lottery, or some internal process similar to the process that led to the creation of .com, .net, and .org. Instead, ICANN elected to solicit proposals and select among the proposals on the basis of the informed discretion of the members of the ICANN Board of Directors. Applicants were required to pay a $50,000 non-refundable fee. From the outside, the bases for ICANN's decisions were not clear. Unsuccessful applicants were naturally suspicious of the outcome, speculating that internal politics and backroom deals had influenced the outcome.[133]

ICANN conceived of this process as an experiment or test. A small number of new gTLDs would allow for the collection and analysis of data and enhance ICANN's ability to make gTLD policy. Three years later, the review is still underway and no new gTLDs

132. ICANN's UDRP requires a registrant to submit to an administrative proceeding if a third party asserts "(i) your domain name is identical or confusingly similar to a trademark or service mark in which the complainant has rights; and (ii) you have no rights or legitimate interests in respect of the domain name; and (iii) your domain name has been registered and is being used in bad faith." ICANN, *Uniform Domain Name Dispute Resolution Policy*, Part 4 <http://www.icann.org/udrp/udrp-policy-24oct99.htm> (Oct. 24, 1999). Likewise, the Anticybersquatting Consumer Protection Act states "[a]ny person who registers a domain name that consists of the name of another living person, or a name substantially and confusingly similar thereto, without that person's consent, with the specific intent to profit from such name by selling the domain name for financial gain to that person or any third party, shall be liable in a civil action by such person." 15 U.S.C. § 1129 (2003).

133. The first and only effort to expand the gTLD name space is further described below. *See infra* pt. IV(A)(1) (ICANN and gTLD Expansion).

have been approved. ICANN's difficulty in formulating gTLD policy has led to many criticisms and proposals, as well as to this article.

D. A Roadmap to the Arguments

Our argument will proceed as follows. We begin with an economic analysis of domain name policy;[134] then, Part II establishes three basic points about the economics of the root: first, the root is an economically scarce resource;[135] second, domain name service is not a public good;[136] and third, networking effects create a natural monopoly in the root.[137] From these three premises, we argue for the conclusion that ICANN should be guided by two principles in managing the root: first, ICANN should allow a market to develop in top level domains, and second, ICANN should manage that market so as to serve the public interest. Our next step is to move from economic theory to practical experience. Part III compares domain name policy with telecommunications policy. The experience of the Federal Communications Commission (FCC) with allocation of the broadcast spectrum and the telephone numbering space provides strong support for a market-based allocation of gTLDs.[138] We integrate theory and practice in Part IV, where we propose a specific plan for gTLD auctions.[139] We then establish that an auction plan would serve the public interest[140] and that an auction is superior to the alternative mechanisms for expansion of the gTLD name space.[141] Finally, in Part V, we explore the mechanisms by which ICANN could move forward and begin the process of gTLD auctions.[142]

II. An Economic Analysis of Domain Name Policy

We begin our analysis of domain name policy with a brief excursion into economics. Economics cannot answer all of the questions raised by domain name policy. First, domain name policy must answer to the discipline of network engineering. A useful domain name system must work, and the functionality, scalability,

134. *See infra* pt. II (An Economic Analysis of Domain Name Policy).

135. *See infra* pt. II(A) (The Root Source is a Scarce Resource).

136. *See infra* pt. II(B) (Domain Name Service Is Not a Public Good).

137. *See infra* pt. II(C) (Networking Effects and the Root Service Monopoly).

138. *See infra* pt. III (Comparisons with Telecommunications Policy).

139. *See infra* pt. IV(B) (Competitive Bidding for new gTLDs).

140. *See infra* pt. IV(C) (gTLD Auctions Would Serve the Public Interest).

141. *See infra* pt. IV(D) (gTLD Auctions Have Comparative Advantages over the Feasible Alternatives).

142. *See infra* pt. V (Conclusion: The Path to Rational Domain Name Policy).

reliability, and stability of the system are determined by the soundness of its engineering. Second, domain name policy must answer to public policy. The Internet is a global network of networks, and Internet policy is answerable to a variety of constituencies, including national governments, the operators of the ccTLDs, Internet Service Providers, information providers, end users of the Internet, and many others. ICANN is a nonprofit corporation required by law to serve the public interest.[143] An economic analysis of root service can answer some, but not all, of the fundamental questions that are raised by domain name policy.[144]

Nonetheless, an economic analysis of domain name policy has an important, indeed a *crucial* role to play. The Internet has been mythologized, and the image of the Internet as a separate realm, somehow exempt from legal regulation and the operation of market forces is still a powerful and compelling ideal in the minds of many.[145] Although this romantic picture may have an element of truth, there is much to be learned by stepping back and looking at root service as an ordinary service, provided by an ordinary organization, subject to the familiar laws of supply and demand. How can the provision of that service be organized so as to provide the greatest benefit of the public? How can the root be put to its highest and best use?

Our answers to these questions begins with a basic truth about the DNS: the root is a scarce resource.[146] We then demonstrate that root service is not a "public good" in the economic sense.[147] Although the root is a private good, it is also a natural monopoly because of

143. *See infra* pt. IV(C)(1) (ICANN's Mandate to Serve the Public Interest).

144. Although our framework in this paper draws heavily on economic ideas, we are not endorsing the claim that efficiency (or welfare) ought to be the sole criterion for the evaluation of public policy. Because our context is the allocation of a scarce resource, used primarily by firms engaged in market activity, it is appropriate that our primary focus is on the highest and best use of that resource. The economic concept of efficiency provides a framework for determining which use is highest and best. For a variety of reasons, however, there may be important uses of the root that would not be selected by the market. We argue that to the extent such uses exist, a gTLD auction would provide the best mechanism for subsidizing these uses. *See infra* pt. IV(C)(2) (gTLD Auctions Serve the Public Interest). In other words, we see economic analysis as an important tool for analyzing root policy, but we do not believe it is the only important tool. *But see* Louis Kaplow and Steven Shavell, *Fairness versus Welfare* 114 Harv. L. Rev. 961 (2001)(arguing that welfarism should be the exclusive framework for the evaluation of legal policies).

145. *See* David R. Johnson & David G. Post, *Law And Borders—The Rise of Law in Cyberspace*, 48 Stan. L. Rev. 1367 (1996).

146. *See infra* pt. II(A) (The Root Is a Scarce Resource).

147. *See infra* pt. II(B) (Domain Name Service Is Not a Public Good).

networking externalities.[148] Finally, we lay out the options available for allocation of a scarce resource.[149]

A. The Root Is a Scarce Resource

In this section, we show that root service is a scarce resource in the economic sense. Before we analyze the root itself, we briefly examine the concept of economic scarcity and define it in contrast to engineering scarcity.[150] We then demonstrate that the root consists of two separate resources—the capacity of the root server system[151] and the root name space[152]—both of which are scarce in the economic sense. Finally, we show that one of ICANN's fundamental commitments with respect to root service—that TLDs shall not be allowed to fail and cease to provide name service—creates an additional and substantial level of artificial scarcity.

1. Economic and Engineering Scarcity

When we say that the root is a scarce resource, we mean that it is scarce in the *economic sense*. The term "scarce" can be used in a different sense, which we call the *engineering sense*. It is important to contrast and compare these two different senses of scarcity. Discussing engineering scarcity and economic scarcity without carefully distinguishing their different meanings is like comparing apples and oranges. Our concern is with the economic idea of scarcity, but much of the discussion of the issue whether the root is a scarce resource is based on the engineering conception of scarcity.

When network engineers or network administrators approach the question of scarcity of domain names, they bring a particular perspective to the table. Does my name server have sufficient capacity to provide name service for everyone who is on my network? Is the set of allowable names large enough, so that I can give a name to everyone who makes a request? Thus, the network administrator for Widgets, Inc., would ask whether her name server can support all the third level domains (3LDs) that are in use or likely to be in use. Perhaps, she needs to support www.widgets.com, ftp.widgets.com, smpt.widgets.com, and network.widgets.com. From her point of view, there is no scarcity. Even if she needed to add hundreds or thousands

148. *See infra* pt. II(C) (Networking Effects and the Root Service Monopoly).

149. *See infra* pt. II(D) (Options for ICANN's Management of the TLD Space).

150. *See infra* pt. II(A)(1) (Economic and Engineering Scarcity).

151. *See infra* pt. II(A) (The Root Server System Is an Economically Scarce Resource).

152. *See infra* pt. II(A) (The Root Name Space Is an Economically Scarce Resource).

of 3LDs to her zone file, her name server could handle the work. If the demand on the name server became too great, she could upgrade the server and software. No matter how many requests for 3LDs she gets, she won't run out of character strings. From the point of view of the network administrator at Widgets, Inc., there is no scarcity in the SLD name server system or in the 3LD name space.

We can look at scarcity in the root in exactly the same way that our hypothetical engineer looks at scarcity in Widget's SLD. From the network engineer or network administrator's perspective, the root is not a scarce resource. There are currently 14 gTLDs and 243 ccTLDs[153] plus one iTLD. This number does not even come close to taxing the capacity of the root server system. Moreover, if a very large number of new gTLDs did begin to tax the capacity of the system, it could simply be reengineered. Nor does the current total of 258 TLDs exhaust the name space. The theoretical capacity of the name space is vast. There are 37 characters in the DNS name set (26 letters, 10 numerals and the "-" (dash) symbol).[154] Single-character domain names are not permitted, but there are 36^2 or 1,296 two-character combinations, $37 * 36^2$ or 47,952 three-character combinations, and $37^2 * 36^2$ or 1,774,224 four-character combinations. If we allow TLD strings of 5 or more characters, then the number of possible strings is vast (although not infinite).[155] From the engineering perspective, the root is not a scarce resource.

There is, however, an economic sense of the word "scarcity" that differs from the engineering sense. Economic scarcity exists whenever something is costly, even if it is abundant. A network engineer might say that there is no scarcity of capacity on an Ethernet network if the engineer has planned for sufficient resources (optical fiber, etc.) to meet anticipated demand out into the foreseeable future. The same engineer might say that storage space on the e-mail server is scarce, if the server is reaching its physical limit. To the economist, both resources are scarce. The various components that produce capacity

153. See Root-Zone Whois Information *Index by TLD Code* <http://www.iana.org/cctld/cctld-whois.htm> (Nov. 26, 2001).

154. The dash cannot be used as the first or last character of a domain name segment. The "dot" (or period) is a segment separator; it cannot be used in a name.

155. The maximum number of characters in a domain name (including TLD, SLD, etc.) is 256. *See LIS 525 - Domain Names* <http://525.fims.uwo.ca/~craven/525dom.htm> (accessed Apr. 16, 2003). Individual components (e.g., SLDs 3LDs) typically have a maximum of 63 characters, depending on the name server. *See* <http://new-website.openmarket.com/intindex/00-06.htm> (accessed Apr. 16, 2003). Either limit would allow more domain names than there are particles in the Universe.

on an Ethernet network all have costs. The optical fiber that created practical abundance is not free.

2. The Root is a Scarce Resource in the Economic Sense

Is the root a scarce resource in the economic sense? The answer is yes, for two distinct and independent reasons. First, the root server system itself is economically scarce.[156] Second, the name space is economically scarce.[157] If either one of these two propositions is true, then root service is a scarce resource from the economic point of view.

The Root Server System Is an Economically Scarce Resource

The root server system is scarce in the economic sense, because root service is not free. To provide root service, there must be root servers (computers that provide root service to the Internet). The root servers (i.e., the computers) are not free.[158] The software that runs the root servers is not free—it took human labor to create that software. The root servers must be maintained, and the labor that does the maintenance is not free. Therefore, root service is scarce in the economic sense. This is not altered by the fact that root server operators donate their hardware and services to the system—the resources that they are donating are scarce in the economic sense.

This same point can be made by examining the capacity of the root server system. The precise capacity of the root server system is not documented and probably the upper limit has not been tested. We shall assume that a conservative upper limit on the current capacity of the system is from 1,000 to 10,000 TLDs.[159] There is demand for TLDs, and the supply is, at least temporarily, limited by the capacity of the root system. It follows from the definition of economic scarcity that TLDs are scarce, and therefore, if TLDs were sold (as we suggest they ought to be), they will command a price.

So far our discussion has assumed a static root server system, but the hardware and software that provide root service is not fixed in stone; therefore, the potential upper limit on the supply of TLDs is

156. *See infra* pt. II(A) (The Root Server System Is an Economically Scarce Resource).

157. *See infra* pt. II(A) (The Root Name Space Is an Economically Scarce Resource).

158. Of course, the owners of the root servers may donate them to the system, but this does not make them free in the economic sense. Someone pays for the root servers; they do not appear out of the ether.

159. Conversation with Andrew McLaughlin, Senior Advisor to ICANN, Mar. 25, 2003.

not inherently static. Even if the existing root server system can only support thousands of TLDs, a new and improved root server system might be able to support millions or even billions of TLDs. But this does not change the fact that root service is a scarce resource in the economic sense. Upgrading the root server system would be costly. The fact that additional root service capacity would be costly is sufficient to establish the conclusion that root service is scarce in the economic sense.

The Root Name Space Is an Economically Scarce Resource

There is another reason why the root is a scarce resource. The root name space is itself scarce. Names are simply strings of characters. If there were no upper limit on the length of a name string, then the name space as a logical construct would be infinite. Even if the limit were 10, the number of logically possible names would be in the quadrillions—so many that there are no conceivable circumstances under which the supply would be exhausted.[160]

Nonetheless, the name space is a scarce economic resource. The economic scarcity of the root flows from the differential value of different names. For example, ".com" is more valuable than ".kjd-7xx9-a," and this is true despite the fact that either string will do equally well at the job of connecting an end user to a server on the net.

There are two reasons to believe that different names have different values. The first reason is that the market prices different names differently.[161] The second reason is that different names have different useful characteristics; another way of putting this second point is to say that different names have different functional utilities.[162]

Different Names Have Different Prices

Consider the first point. Different names have different prices. This can be demonstrated in two ways. First, experience in the SLD markets demonstrates that different names have different economic values. ICANN has imposed uniform pricing across strings[163] by contract in the primary market for SLDs registered in .com, .net, and

160. The number of strings is $37^{10} + 37^9 + \ldots + 37^1 = 4{,}942{,}156{,}160{,}540{,}570$ (roughly 5 quadrillion). That would allow nearly a million domain names per person on Earth.

161. *See infra* pt. II(A) (Different Names Have Different Prices).

162. *See infra* pt. II(A) (Different Names Have Different Functional Utilities).

163. Different registrars can compete with each other on the basis of price, but they cannot charge different prices for different strings.

.org. If you go to a particular registrar, that registrar will charge you the same price for "auto.com" (if it were available) as for "7skj989-2.com" (if it were available). There is, however, a secondary market for domain names in these gTLDs, and on that secondary market some SLD name strings command much higher prices than others. For example, in 1997 the SLD "business.com" was sold for $150,000.00.[164] And taste.co.uk was sold for £110,000.[165] Moreover, price differentials are allowed for some ccTLDs. The ccTLD for Tuvalu (.tv) markets different names at differential prices.[166] It is beyond dispute that different SLDs sell for different prices in both the secondary and primary markets.

So far, we have been discussing SLDs. Would there be differential prices for TLDs if there were a market? That the answer to this question is "yes," can be established by two arguments. First, there is simply no account of the functional differences between SLDs and TLDs that would predict massive price difference for the former and no price differences for the latter. Second, a simple thought experiment establishes that prices would indeed be different. Imagine, for example, that ICANN conducted an auction for the following two TLD strings: ".sex" and ".8ki3-d." We doubt that any reader believes these two strings would receive equal bids—assuming the winning bidder was allowed to charge market prices for registration with their TLD. It is obvious that .sex would command a relatively high price,[167] and the other string would either attract no bids or bids at a much lower level.[168]

164. *See* Nick Wingfield, *Domain name fetches record price* <http://news.com.com/2100-1023-200256.html?legacy=cnet> (June 4, 1997).

165. *See* Name Shop, Name-Shop press bulletin No.1 (*Highest price yet for a .co.uk name?*) <http://www.name-shop.com/corp_pres.htm#highest> (Oct. 9, 2000).

166. *See* .tv, The .tv Corporation, A Verisign Company, *www.tv* <http://www.tv/en-def-6cd8f1c15956/cgi-bin/glob.cgi?domain=www.internet.tv> (accessed April 9, 2003) (offering network.tv for $25,000 per year); *see also* The .tv Corporation, *What is a .tv* <javascript:popLookup('/en/care/popup_premium.shtml','toolbar=0,location=0,directories=0,status=0,menubar=0,scrollbars=1,resizable=0,width=520, height=400'> (accessed April 9, 2003).

167. *See* Anupam Chander, *The New, New Property*, 81 Tex. L. Rev. 715, 728 (2003) ("In the case of *Kremen v. Cohen* (99 F. Supp. 2d 1168 (9th Cir. 2000)), a federal judge valued the use of sex.com over the previous five years at $ 65 million").

168. Of course, there are imaginable scenarios in which the meaningless string would attract a high price. For example, if someone devised a use for a TLD that required that the string almost never be entered by accident, and if only one new TLD would be allowed into the root, an arbitrary meaningless string might command a high price. But this example merely confirms our point, that different TLD name strings will command different prices in a market.

Different Names Have Different Functional Utilities

There is a good reason why the market prices different strings differently. Not all names are created equal. Some names are more useful than others. Why? Because names have semantic and syntactic properties that affect their usability. We have identified five such properties, although we suspect that there are more.

Guessability

One reason why some names are more valuable than others has to do with the way end users interact with the DNS. We have learned that you frequently can get to a useful domain on the basis of a guess. Thus, if I want to go to the website for the International Business Machines Corporation, I am fairly likely to get there by guessing "www.ibm.com." If I want to go to a website that provides products, services, or information relating to automobiles, it is likely that entering "www.auto.com" or "www.car.com" or "www.automobile.com" will do the trick.

The examples in the previous paragraph are SLDs, but the same thing is likely to be true of TLDs. It is no accident that the new TLDs created by ICANN all have names that facilitate guessing; an obvious example is .museum. If the root were expanded and there were many new TLDs, the guessing that takes place in .com TLD would likely take place in the root. For this reason, guessable names are likely to be more valuable than names that cannot be guessed.[169]

Memorablility

Some names are more memorable than others. For example, www.amazon.com is not a guessable name for an online book merchant, but it is a memorable name. Strings that are memorable, such as .biz or .web, are more valuable than strings that are difficult to remember. Memorability can be a function of either the syntactic or semantic properties of string. The string "ZZZ" might be memorable, although it lacks semantic meaning. Likewise, the string "perspicaciousness" might be very difficult to remember, even though it does have semantic meaning. The string "8k" is very short, but might not be memorable. The string "remember-nine-eleven" might be memorable although it is quite long by domain name standards.

169. *See infra* pt. IV(D)(2) (The Taxonomy Alternative). Guessability is not the only factor that accounts for the differential value of different strings. We argue that guessability does not justify taxonomizing the root below.

Branding

Yet another reason for differential utility is branding. Some strings are more valuable than others because they are more easily associated with particular firms or brands. Thus, if IBM were to operate a proprietary TLD, the string .ibm would have greater utility than .9ks. IBM is a contraction for International Business Machines, but branding does not depend on semantic meaning. Toyota is an effective brand name, even though it had no prior semantic meaning in English.[170]

It might be argued that branding utility can only create differential value if cybersquatting is permitted, but this is not the case. If we assume a perfect mechanism for prevention of cybersquatting on trademarks, branding will still create differential value, assuming a limited number of slots for new TLDs. Suppose, for example, that fifty new slots were available. It seems likely that some multinational corporations (such as IBM, Sony, or Nike) would be willing to bid for a slot and the string naturally associated with their brand names, even if no other party would be allowed to bid on that string.

Meaningfulness

Meaningful strings are strings that have semantic meaning in some natural language. Thus "air," "aero," and "luft"—all are meaningful strings. All else being equal, meaningful strings are likely to be more memorable or guessable or brandable, and hence more valuable. Not all meanings are created equal, however. Some meaningful strings are likely to have low value, because of negative connotations. Thus "dour," "prissy," and "putrid" are likely to be low value strings—although they are meaningful, memorable, and relatively easy to enter. On the other hand, some strings have positive connotations. Thus, "awesome," "excellent," "cool," or perhaps "phat" are likely to be higher value strings.

Enterability

Strings that are easy to enter have more value than strings that are difficulty to enter. Thus "fj" might be a more valuable string than "zp," because of the placement of these characters on the standard

170. The Toyota Motor Corporation was originally named "Toyoda," after its founder Eiji Toyoda. It was renamed in 1983 "because of the more propitious Japanese ideographs involved." *See* Ross Finlay, *Toyota: Started With British Money* <http://www.carkeys.co.uk/features/FE000247.htm> (July 31, 2001).

qwerty keyboard. Shorter strings are more easily entered than longer strings, and familiar strings are more easily entered than strange strings. Because of the pervasive use of QWERTY keyboards, some strings produce fewer entry errors than others simply because a touch typist is more likely to strike the keys correctly.

Summary

Undoubtedly our list of factors that create differential functional utility for strings is incomplete. But guessability, memorability, branding, meaningfulness and enterability are sufficient to establish our thesis. Different strings have different functional utilities. When this functional utility is combined with our prior point about differential prices, the support for our conclusion is very powerful indeed. The name space is a scarce resource, because each string is unique and different strings have different values.

This point is reinforced by comparing the name space with another resource: land. One might argue that land is not scarce. There is plenty of unused land. If someone needs land, they could be allocated a parcel from the unused stock (such as in the Gobi desert or Antarctica). But from the fact that the unused supply of land is enormous, it does not follow that land is not a scarce resource in the economic sense. Land is valuable. Although some land is so cheap that it is virtually free, many parcels of land command extremely high prices. That is because different parcels of land have different functional utilities, based on a combination of factors, such as location, flatness, soil quality, and so forth. Although there are hundreds of millions of acres of unused land, land is a scarce resource in the economic sense. As with land, so with names.

3. Commitment to Indefinite Service Guarantees to SLD Registrants Produces Additional Artificial Scarcity

There is yet another reason why the root is a scarce resource. This reason is subtle and to our knowledge has never been discussed in the literature, but it has important implications for DNS policy. The root is artificially scarce because of the assumption that TLDs should not be allowed to fail.[171] By the assumption that TLDs should not be allowed to fail, we mean that many Internet policy makers believe that if a TLD proprietor were to fail as a business, the SLD

171. *See* Thread initiated by Karl Auerbach, *Re: A question re less market, more community* <http://www.icannwatch.org/comments.pl?sid=1252&op=&threshold=1&commentsort=0&mode=thread&pid=11471#11473> (accessed Apr. 16, 2003).

registrants in the TLD should continue to receive name service through some backup mechanism. If the failure of the TLD were caused by mismanagement, then the TLD might simply be sold to another operator, but the failure of the TLD might also be due to the business plan and the nature of the string—making it unlikely that another operator would willingly undertake the obligation of operating the domain.

We can illustrate the possibility of a "bad string" with an example. Suppose a nonprofit association created a ".parks" TLD, and only public park systems were allowed to register SLDs, and only individual parks or park-related entities were allowed to register 3LDs. Further suppose that this plan failed, because only 95 individual parks were ever registered. (It turned out that the various governmental organizations that run parks became uninterested in the plan for ".parks" after they had sent letters of support to ICANN.) If we are committed to continuity of service, then an entire TLD would be locked up in perpetuity to serve these 95 3LDs. The .parks TLD would represent waste, because the TLD slot could be put to a higher and better use.

If there are only 1,000 to 10,000 slots available, then the commitment to perpetual service compounds the scarcity of the root resource. Suppose that ICANN decided that 1,000 slots could be made available. If all 1000 slots were allocated at one time (call this a "big-bang" allocation), then it might well be the case that a substantial number of the 1,000 slots would be dedicated to uses that would, in the end, turn out to be failures. This is especially likely to be true, because a "big bang" auction would result in firms making decisions about what TLDs are economically valuable with very little information from the market. There are only 14 gTLDs as of this writing, and current experience with that number provides very little information about how the market would operate once 1000 gTLDs were up and running.

This problem of scarcity is even more acute because the most useful TLD strings are likely to change over time. In 2004, there may be a need for a .mobile TLD for mobile phones, but in 2010, there may be an entirely new kind of technology that creates demand for a new TLD. Given a "big-bang" allocation, all the slots might be taken. If the 1000 slots were allocated at the rate of 20 per year, new slots would still be available in 2010.

Of course, if our assumption is incorrect and TLDs are allowed to fail, then the problem is much less significant. If there is strong demand for a new TLD in 2010 and all the slots are taken, one slot

could be sold on the secondary market. The new proprietor could evict the existing SLDs (perhaps with a one-year grace period) and then substitute a new string for the old string. It is our position that this is the first-best option. The market should determine whether new TLDs succeed or fail and hence whether TLD slots are reallocated.[172]

Even if we are right about the security issue, ICANN may choose to elevate consumer protection over economic efficiency by insuring that failed gTLDs continue to operate. If ICANN chooses to do this, that has consequences for the scarcity of the root. In particular, a guarantee of service for the customers of failed gTLDs leads to the conclusion that the root should not be expanded through a big bang, but instead should be expanded through annual allocations of some fraction of the total slot capacity of the root—a second-best solution.[173]

In this section we have attempted to show that root service is a scarce resource. This conclusion provides a key assumption for thinking about root allocation. Were the root not scarce, an allocation mechanism would be unnecessary. Everyone could simply have as many TLDs as he or she wished. But, since the root is scarce, some means must be employed to allocate TLDs. We next consider how both TLDs are and ought to be allocated. Again, economic analysis of root service is a crucial step in the formulation of rational TLD policy.

B. Domain Name Service Is Not a Public Good

From the standpoint of neoclassical economics, a good place to begin an analysis of root allocation and the creation of TLDs is the question, "Should root service be provided by the market?" One reason for answering such a question in the negative is that the good or service in question is a "public good," which ought to be provided by government or a public entity. National defense and clean air are usually considered public goods. Conversely, if root service is a

172. A market-based approach would allow consumers to shop based on the long-term security of the TLD. For example, .com might be marketed on the basis that as the largest and oldest commercial gTLD, it is more secure than a newcomer, such as .business. We see no reason to believe that ICANN should intervene and require a higher level of security.

173. *See* R.G. Lipsey & Kelvin Lancaster, *The General Theory of the Second Best*, 24 Rev. Econ. Stud. 11 (1956).

"private good," then well-established and uncontroversial economic theory suggests that it can best be provided by markets.[174]

The phrase "public good" is ambiguous. In one sense, the public good is simply whatever is in the interest of the public as a whole; in this sense, "public good" is a synonym for "common weal." Economists use the phrase "public good" in a more restricted and technical sense. A given good or service is a "pure public good" if, and only if, it meets the following two criteria: (1) nonrival consumption, and (2) nonexcludability. By "nonrival consumption," economists mean that consumption of the good by one individual does not limit the availability of the good to any other individual. By "nonexcludability," economists mean that the providers of the good or service are unable to exclude individuals from access to the good.[175]

Consider the example of national defense. National defense meets the criterion of nonrival consumption, at least for a broad range of cases. If the United States has a strong national defense, then everyone who lives in the United States benefits equally. The security that I receive from the maintenance of the Army, Navy, Air Force, and Marines of the United States Armed Forces does not diminish the security that other residents of the United States receive from them.[176] National defense also meets the criteria of nonexcludability. It would be difficult or impossible to exclude specific individuals from that benefit.[177] Because national defense meets the two criteria, it cannot be provided by markets. Suppose a private firm tried to provide national defense for a monthly charge. Would it be rational to pay the charge? Because the private firm could not exclude me if I did not pay the charge, it would be economically rationale for me to refuse to pay the charge. That is, it would be economically rational for me to be a free rider. If everyone were economically rational, no one

174. *See* Mueller, *supra* n. 92, at 9; *see also* Paul Samuelson, *Pure Theory of Public Expenditure,* 36 Rev. Econ. & Statistics 387 (1954).

175. *See* Mueller, *supra* n. 174, at 11; *see also* Mark Blaug, *Economic Theory in Retrospect* 580 (5th ed. 1996).

176. The statements in text are simplifications. In fact, national defense is not perfectly nonrivalrous. Thus, if the United States Armed Forces commit significant resources to the defense of Hawaii those same resources are not available for defense of Maine. *See, e.g.,* Larry J. Sechrest, *Privateering and National Defense: Naval Warfare for Private Profit,* The Independent Institute, Sept. 2001 <http://www.independent.org/tii/WorkingPapers/Sechrest6.html> (accessed Feb. 7, 2004). For the purposes of illustration, however, the simplified account in text is adequate.

177. Once again, the account in text is simplified. Regions or communities could be excluded from national defense. For example, if Hawaiians refused to contribute to a voluntary national defense scheme, then the military could stop protecting Hawaii. Again, the simplified account in text is adequate for illustrative purposes.

would pay the charge, and the market, therefore, would fail to provide national defense. Government can eliminate the free rider problem by paying for national defense with compulsory taxes.

With this outline of the economic notion of a public good in place, we turn to our main question: "Is root service a public good?" In the domain name policy literature, statements are sometimes made that suggest that the answer to this question is yes.[178] For example, the gTLD-MoU, an effort to establish an informal transnational agreement on domain name policy states, "the Internet Top Level Domain (TLD) name space is a public resource and is subject to the public trust."[179] A similar statement can be found in the *Final Report of the International Ad Hoc Committee: Recommendations for Administration and Management of gTLDs*,[180] and in the operating principles of the Government Advisory Committee to ICANN.[181] Typically, these statements are not supported by analysis or reasoning of any kind; for this reason, it is difficult to discern what these statements mean.[182] Indeed, as part of the process that eventually lead to the creation of ICANN, the Department of Commerce of the United States Government received comments on both sides of the question whether the name space should be viewed as a public resource.[183] Moreover, those who participate in domain name policy

178. *See* Joseph Liu, *Legitimacy and Authority in Internet Coordination: A Domain Name Case Study*, 74 Ind. L.J. 587, 604 (1999).

179. *Establishment of a Memorandum of Understanding on the Generic Top Level Domain Name Space of The Internet Domain Name System (gTLD-MoU), "Section 2.-Principles"* <http://www.gtld-mou.org/gTLD-MoU.html> (Feb. 28, 1997).

180. *See* International Ad Hoc Committee, *Final Report of the International Ad Hoc Committee: Recommendations for Administration and Management of gTLDs* <http://www.gtld-mou.org/draft-iahc-recommend-00.html> (Feb. 4, 1997) ("The Internet top level domain space is a public resource and is subject to the public trust.").

181. *See* The National Office for the Information Economy, *Operating Principles* <http://www.noie.gov.au/projects/international/gac/docs/Operating_Principles-English.htm> (May 25, 1999) ("The Internet naming and addressing system is a public resource that must be managed in the interests of the global Internet community."); *see also* ICANN, *GAC Statements Concerning ccTLDs* <http://www.icann.org/cctlds/gac-statements-concerning-cctlds-16dec01.htm> (accessed Dec. 16, 2001); ICANN, *Opinion of the Governmental Advisory Committee on New Generic Top Level Domains* <http://www.icann.org/committees/gac/new-tld-opinion-16nov00.htm> (Nov. 16, 2000).

182. Milton Mueller made this point forcefully. *See* Posting of Milton Mueller, mueller@syr.edu, to wg-c@dnso.org <http://www.dnso.org/wgroups/wg-c/Arc00/msg00639.html> (Aug. 7, 1999).

183. *See Summary of Comments: Appendix A, Registration and Administration of Internet Domain Names,* <http://www.ntia.doc.gov/ntiahome/domainname/DNSComments_SUM.htm> (accessed Mar. 22, 2003).

discussions are frequently woefully ignorant of even the most basic economic concepts.[184]

We believe that this issue can be clarified by adopting the following conceptual distinction. We shall reserve the use of the term "public good" for those goods or services that meet the technical economic definition of a public good. We shall use the term "public resource" for a good or service that is owned or controlled by government—whether or not the resource is a public good.

Given this distinction, root service is clearly not a public good in the economic sense. This conclusion can be established by examining two different perspectives—those of end users and TLD proprietors. First, we look at root service from the point of view of end users[185] of the Internet who want to locate a given computer or server by entering a domain name in an application; from this first perspective domain name service does look like a public good. Second, we look at root service from the point of view of proprietors of TLD registries, who want users to be able to locate the name server for their TLD by entering its domain name in an application.[186]

Suppose that you are using the World Wide Web and that you wish to browse to Amazon.com website by using the domain name "www.amazon.com." Does your consumption of root service rival that of other users? In theory the answer to this question might be "yes," because root servers have a limited physical capacity. Your query might be bounced, because all of the root servers might be utilized to capacity. In practice, this is unlikely to occur, because of the distributed nature of the DNS. Given that the root file is cached at numerous locations, users rarely need to access the root server to resolve a TLD. Indeed, the overwhelming majority of queries that reach the root servers are misspellings of TLDs, e.g., .c0m or .cpm is entered for .com.[187] For all practical purposes, my consumption of root service does not rival yours.

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184. An especially egregious example is the statement of Barbara Dooley at hearings held by subcommittees of the Science Committee of the United States House of Representatives. Ms. Dooley asserted that the name space was not a public good, because (unlike the broadcast spectrum), the name space did not involve a scarce resource. *See* Barbara Dooley, Executive Director, Commercial Internet Exchange Association (CIX), House of Representatives, *Improving Technical Management of Internet Names and Addresses* <http://www.house.gov/science/dooley_03-31.htm> (accessed Mar. 22, 2003).

185. *See supra* n. 16 (defining end user in contrast to information providers).

186. Note that we are using the terms "browser" and "proprietor" in a stipulated sense and these terms can be and are used differently in other writing about the Internet.

187. *See* Vint Cert, *Oral Remark at ICANN Meeting at Amsterdam.* (there are a substantial number of queries to the root servers). *See, e.g.*, Internet Software Consortium,

Likewise, the architecture of the Internet does not facilitate excludability. Although the root servers could be password protected and a fee could be charged for access, users could easily locate the IP Address for a given TLD name server without paying the fee—precisely because that information is cached and made publicly available at innumerable locations on the Internet. Of course, further alterations could be made to exclude free riders from access to the database of domain names, but because that database is not subject to intellectual property protection,[188] excludability will be difficult to maintain. In other words, from the user's perspective, domain name service appears to be a public good. However appearances, in this case, are deceiving.

From the proprietor's perspective, it becomes clear that root service is not a public good. First, root service to the proprietors of TLD registries is rivalrous. If the root points to a name server (or system of parallel name servers) operated by Verisign to provide name service for the .com TLD, then it cannot also point to a name server (or system) operated by a different registry for the .com TLD.[189] For name service to work, each domain name must resolve to a unique IP Address. This in turn requires that each second level domain must be identified by a unique (or coordinated set of) first level domain name server(s). If Verisign operates the name server for .com, then no one else can operate that same name server for a given root. Hence, in the economic sense, root service, as well as other name services, is rivalrous.

F.root-servers.net <http://www.isc.org/services/public/F-root-server.html> (accessed Mar. 22, 2003) (indicating the root server F receives 282 million queries per day).

188. The United States Supreme Court has indicated that facts are not protected by the copyright laws. *See Feist Publications, Inc. v. Rural Telephone Service Co.*, 499 U.S. 340 (1991) (denying copyright protection to phone book). The European Union does provide intellectual property protection for data bases. *See generally* FindLaw, *European Union Database Protection* <http://cyber.findlaw.com/ip/eu_database.html> (accessed Mar. 22, 2003).

189. The discussion in text is simplified. A root server could direct different users to different TLDs based on information provided by the query. Something like this happens with second level domain servers and third level domains. Different users will be directed to different web pages by entering "http://www.cnn.com" because the name server at cnn.com can differentiate between users. However, all users who enter "http://cnn.com" are directed to the same page. This point was made to the authors by David Steele in a telephonic conference call on February 14, 2003. This point, however, does not alter the main conclusion reached in text. Root service would still be rivalrous, even if the root differentiated among users, because whatever criteria could be used to differentiate queries, a given TLD must lead to the same domain for users who are identically situated with respect to the criteria.

Second, root service to the proprietors of TLD registries is excludable. Any given TLD can either be included or excluded from the root. Thus, the operator of the root can sell root service to TLD registries. If the proprietor of a given TLD registry refuses to pay, then the operator of the root can simply eliminate the TLD from the root or point to a name server operated by a rival registry proprietor. Hence, root service is excludable in the economic sense. By extension, all levels of name service are similarly excludable.

What are the implications of the conclusion that root service is a private and not a public good? At this stage, we will set aside the question whether there can be competition for root service.[190] Given that root service is a private good, it could be provided efficiently by firms (that is, profit seeking entities, such as for-profit corporations).

Private firms could sell root service. This could be accomplished through a variety of pricing mechanisms. As we have already discussed, it would be difficult to sell root service directly to users and therefore root service providers would be more likely to sell root service to the proprietors of TLDs. Root service would be one of the factors (costs) of operating a TLD, and hence would be incorporated into the price the TLD operators charge to registrants of Second Level Domains (SLDs), assuming the TLD proprietor was in the SLD business.[191] What price would be charged? If there were competition in the market for root service, the price would equal the costs of root service (including, of course, the cost of capital in the form of interest to lenders and dividends or share price appreciation for equity holders). Given that the cost of providing root service is relatively low,[192] the price would be low.

Another question concerns what economists call "metering." Would root service providers charge every gTLD operator a flat fee or would such providers attempt to meter the usage of root service associated with each TLD proprietor and charge based on metered usage? Of course, the price could be a combination of a flat fee (a connection charge) and a metered fee. Direct metering is possible,

190. *See infra* pt. II(C) (Networking Effects and the Root Service Monopoly).

191. Some TLD operators might not sell SLDs. For example, if .ibm were a TLD, then International Business Machines might use .ibm for its own purposes and not offer any other entities registrations in .ibm. In that case, the cost of .ibm would be passed on to the purchasers of IBM products.

192. ICANN provides the IANA functions for the entire Internet for only a few million dollars per year. *See* IANA, *Progress Report on Performance of IANA Functions* <http://www.iana.org/periodic-reports/progress-report-may-jul00.htm> (May-July 2000). As of this writing, we have yet to determine the actual cost of the IANA functions.

because each query to the root can be logged. Indirect metering is another option; for example, TLD proprietors could be charged on the basis of the number of registrations—assuming that registrations correlate strongly with the demand for root service.

Why should private goods be provided by markets? At a fundamental level, the answer to this question lies in the Pareto Principle:[193] given the possibility of improving the welfare of one individual without harming anyone, the Pareto Principle requires that we take the action that results in the improvement. A market transaction, where individual X and individual Y voluntarily exchange some good or service G for payment M, is required by the Pareto Principle, unless the transaction results in an externality—that is, a cost or harm to some third party, Z. Markets both allow Pareto-efficient transactions, and give incentives for all such transactions to take place. In a market, the purchaser who derives the greatest benefit from a good or service will be willing to pay the highest price. For this reason, markets put resources to their highest and best use.

In the context of domain name policy, the point is that a market will allow the root to be put to its highest and best economic use. Unless a particular TLD would create a negative externality—a harm to the root itself or Internet users—the Pareto Principle says that TLD should be created. This is the economic version of what has been called *Cerf's Principle*: a string should enter the root if it will do no harm.[194] Economists would extend this principle: a TLD string or

193. There are actually two Pareto Principles, Strong Pareto and Weak Pareto. Strong Pareto requires actions that improve the welfare of every person. Weak Pareto requires actions that improve the welfare of at least one person but do not make any person worse off. *See, e.g.*, Howard F. Chang, *A Liberal Theory of Social Welfare: Fairness, Utility, and the Pareto Principle*, 110 Yale L.J. 173, 176-77 (2000).

194. The principle is named after Vinton Cerf. *See* gTLD-auctions.net, *gTLD-auctions.net* <http://gtld-auctions.net/> (April 5, 2003) (According to *Cerf's Principle*, "a new TLD should be allowed in the root so long as it does no harm."); Lawrence Solum, *Cerf's Principle: A String Should Enter the Root if It Does No Harm*, ICANN Watch <http://www.icannwatch.org/article.pl?sid=03/03/27/1849224&mode=thread> (Mar. 27, 2003). Cerf's principle is a corollary of Karl Auerbach's "First Law of the Internet," which states:

> "Every person shall be free to use the Internet in any way that is privately beneficial without being publicly detrimental. The burden of demonstrating public detriment shall be on those who wish to prevent the private use. Such a demonstration shall require clear and convincing evidence of public detriment. The public detriment must be of such degree and extent as to justify the suppression of the private activity."

Karl Auerbach, *First Law of the Internet*, ICANN Watch <http://www.icannwatch.org/comments.pl?sid=1242&cid=11389> (Mar. 27, 2003).

slot should be freely exchangeable, unless its exchangeability would harm some third party.

C. Networking Effects and the Root Service Monopoly

The story we have told so far has made an important assumption—that there could be more than one firm that provides root service.[195] From the technological point of view, there is no barrier to the creation of alternative roots. ICANN could operate one root system, and one or more other entities could operate competing roots. In fact, there are alternative root services.[196]

However, the alternative roots provide service to only a tiny fraction of Internet users.[197] Why? In the paragraphs that follow, we will demonstrate that the economics of root service strongly favor a single root. The arguments that we make do not depend on technical considerations. Even assuming that multiple roots were technically feasible, the marketplace would result in a single root (or perhaps a dominant root, with a tiny fraction of purchased domain names residing in alternative roots). Our demonstration is based on two ideas: (1) the economic notion of networking effects, and (2) the cost structure of root service providers. As we show, these two factors would inevitably lead a system that began with competing alternative roots to evolve into a system with a single root. The same factors prevent a system with a single root from evolving into a system with multiple roots.

195. *See* David Post, *Some thoughts on Stuart Lynn's 'Authoritative Root' Discussion Draft*, ICANN Watch <http://www.icannwatch.org/article.pl?sid=01/06/01/095409> (June 1, 2001); ICANN, *ICP-3: A Unique, Authoritative Root for the DNS* <http://www.icann.org/icp/icp-3.htm> (July 9, 2001); ICANN, *Keeping the Internet a Reliable Global Public Resource: Response to New.net 'Policy Paper,'* <http://www.icann.org/icp/icp-3-background/response-to-new.net-09jul01.htm> (July 9, 2001); Internet Architecture Board, RFC Editor, *IAB Technical Comment on the Unique DNS Root, Request for Comments: 2826*, <http://www.rfc-editor.org/rfc/rfc2826.txt> (May 2000).

196. *See* CNET News.com, *Rogue Domains Revolt* <http://news.com.com/2100-1023-275957.html?tag=rn> (Mar. 4, 1997).

197. *See id.* (quoting Karl Denninger as stating that names in alternative roots, "are recognized at present by only about one-half of one percent of the Internet."); *see also* Open Root Server Confederation, *Openness is a Key Aspect of the ORSC* <http://www.open-rsc.org/draft/v5/v5.1/openness/> (accessed Mar. 22, 2003). The Open Root Server Confederation (ORSC) proposed an open root. TLDs could be added by an entity the met the membership qualifications of the federation, e.g., the ability to operate a name server that could handle anticipated traffic. *See id.* Thus, they essentially proposed a rule of first occupation for the TLD space.

First, consider "networking effects" or "networking externalities," terms we are using in a technical economic sense.[198] The value of root service increases with the number of users of the service. A single root with many users is more valuable than a single root with few users. Given any arbitrary number of users, root service is more valuable if all of the users patronize the same root, and as a consequence, root service is less valuable if the same users divide their patronage among two or more competing roots. Second, consider the cost structure of root service providers. Much of the cost of operating a root is fixed. Although a root with more customers in theory requires more server capacity, given the distributed nature of the DNS, the marginal costs of serving additional customers are relatively small as a share of total costs. Given these two factors (networking effects and a high ratio of fixed to marginal costs), rational TLD proprietors will choose to purchase root service from the market leader. This is because the market leader provides a more valuable service at a lower cost. Internet Service Providers will point toward the market leader's root server, because the market leader's root service is more valuable to the ISPs customers than is the root service provided by other root service providers. Both the networking and cost effects become more and more pronounced as the market share of the market leader becomes larger and larger. For this reason we would expect the market to lead to a single firm providing root service, i.e. root service will be provided by a monopolist.[199]

The way that networking effects operate with respect to root service can be illustrated by performing a thought experiment. Imagine that the root became fragmented. If there were many competing roots, and many competing sets of TLDs, then different users would reach different destinations by entering the same domain name. ICANN's root presumably would result in www.amazon.com being resolved to the IP Address of the e-commerce retailer in Seattle, Washington. An alternate root might result in the same domain name being resolved to a tour operator in Brazil. Different Internet Service Providers (ISPs) would point requests for root

198. *See* Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 Cal. L. Rev. 479 (1998); *see, e.g.*, Oz Shy, *The Economics of Network Industries 1-6* (2001); S.J. Liebowitz & Stephen E. Margolis, *Network Externality: An Uncommon Tragedy*, 8 J. Econ. Persp. 133 (1994); Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 Am. Econ. Rev. 424 (1985) Philip H. Dybvig & Chester S. Spatt, *Adoption Externalities as Public Goods*, 20 J. Pub. Econ. 231 (1983).

199. *See* Froomkin, *supra* n. 97, at 840 (arguing that alternate roots are feasible, but "if too few people use the alternative root, it remains unable to grow.").

service to different root servers. As a result, individuals would get different results for the same domain name when they moved from one ISP (at home) to another (at work or at an Internet café). As fragmentation increases, the value of domain names decreases.[200] If I am an Internet user, I am less likely to invest in memorizing or memorializing "www.amazon.com" if it doesn't reliably get me to the website I am seeking. If I am a website proprietor, I am less likely to invest in publicizing a domain name if users will frequently be directed to another proprietor's website when they enter the string of characters that I am advertising.

Networking effects can be observed in many contexts other than the domain name system. The World Wide Web itself is more valuable because it has many users. Likewise, a single integrated world wide telephone system is more valuable than would be a series of competing systems, each of which has users who could not make connections to users of the competitor's systems. Microsoft Office dominates the market for word processing and spreadsheets in part because there is an advantage to using the same word processing and spreadsheet programs as do many other users. Users have a greater incentive to invest in learning program specific skills if it is likely that those skills will be transportable to other locations, workplaces, and so forth. Collaboration is less costly if the collaborators use the same program.

So far, we have been discussing economic theory. The actual story of the emergence of ICANN's root service monopoly is somewhat different. Because the Internet emerged from a government research project, only one entity provided root service early in the history of the Internet. That entity (IANA, i.e., Jon Postel) received a government subsidy for the provision of root service. That is, one entity provided root service for free. It is hardly surprising that no effective competitor to ICANN has emerged. By the time the government subsidy for root service ended and ICANN began charging TLD proprietors, ICANN was already an effective monopolist. Given networking effects and the cost structure of root service, there were very substantial barriers to the entry of competitors.

200. This conclusion would hold even if ISPs or third-party vendors provided a service that aggregated alternate roots, giving users a menu of the alternate destinations for a given domain name. The extra step, choosing among the alternative resolutions, increases the time required (and hence the cost) of the aggregated alternative root services.

What is surprising is that any alternative root service providers exist at all. What explains the emergence of these failed attempts to compete with ICANN? The most obvious explanation is ICANN's restriction on the TLD space. In particular, ICANN has taken a very cautious approach to the creation of new gTLDs. Firms that desired to enter the market as registries (operators of top level domains) were required by ICANN to pay a $50,000 fee to submit an application, with no realistic basis for estimating the probability of success and no clear criteria on the basis of which their application would be accepted or rejected. Even so, ICANN received forty-four qualifying applications, of which seven were ultimately accepted.[201] Establishing an alternative root is an alternative route to the establishment of a new gTLD. Because an alternative root can be a superset of the root administered by ICANN, firms establishing an alternative root had some hope of overcoming the networking effects and cost structure that tend to reinforce ICANN's monopoly.

Profit-maximizing firms with monopolies will (in the absence of price regulation) extract monopoly rents. That is, they will charge rents that exceed their costs. Unless the monopolist can successfully engage in price discrimination, monopoly rents will be inefficient. The monopoly rent raises the price of the monopoly good, and as a result, some consumers of the good who would have paid the market price will not consume the good. In the case of domain names, however, price discrimination is a real possibility.[202] For example, the monopoly proprietor of the root could auction TLDs. If a firm wished to become the proprietor of the .biz TLD, the monopolist could auction .biz. In cases where no bidder possesses monopsony power,[203] the

201. Forty-seven entities submitted applications, some with dozens or hundreds of proposed new TLD strings. Three of the submitters failed to meet qualifying criteria, leaving forty-four valid applications. *See* ICANN, *TLD Applications Lodged* <http://www.icann.org/tlds/tld-applications-lodged-02Oct00.htm> (Oct. 10, 2000). The accepted applications were for .aero, *see supra* n. 115; .biz, *see supra* n. 116, .coop; *see supra* n. 118; .info, *see supra* n. 121; .museum, *see supra* n. 124; .name, *see supra* n. 125; .pro, *see supra* n. 129.

202. In fact, the proprietor of the .tv ccTLD does engage in price discrimination for SLDs, setting higher prices for domain names that are easy to remember and intuitively associated with potential e-commerce business models. *See* .tv, *Premium Name Showcase* <http://www.tv/en-def-a0c6a3d7bc33/cgi-bin/premium_search.cgi> (accessed Mar. 22, 2003) ("Premium names are generic words and phrases, and one-, two-, and three-character .tv domain names that are registered at prices higher than the standard annual fee.").

203. There may well be cases in which one bidder will possess monopsony power. For example, the owner of a trademark may have a legal monopoly over use of the mark. For this reason, it may be that a TLD name that is identical or substantially similar to a

auction price should provide a monopoly rent to the root-service proprietor and also insure that the TLD goes to its highest and best economic use.

There are, moreover, limits on the rent that a monopoly proprietor of the root could charge. Most obviously, the monopolist could not charge a rent in excess of the value of the TLD to potential purchasers. There are additional limits. At bottom, the Internet is a communications system, and as such, it competes with other systems. If the proprietor of a root charged too much for root service, end users and information providers would use alternative communications systems, e.g., telephone, broadcast, direct mail, and so forth.

So far, we have assumed that the proprietor of the root is a profit-maximizing firm and will charge monopoly rents. Does ICANN profit-maximize? An adequate account of the institutional economics of nonprofit corporations is far beyond the scope of this essay.[204] Rather, we suggest the following tentative hypotheses about ICANN. First, ICANN does not maximize profits in the way that for-profit firms do. That is, ICANN does not seek to maximize its revenues from root service. Indeed, ICANN continues to provide root service to ccTLD operators who refuse to pay ICANN any fee at all. ICANN, as a nonprofit corporation operates the root in the public interest; as a nonprofit corporation organized under the laws of the State of California, it therefore must have a "public or charitable purpose."[205]

The obligation to act in the public interest is, however, abstract and vague. This is true both as a matter of political philosophy and as

trademark may have a legal right to exclude others from acting as proprietors of their TLD.

204. A classical approach to the institutional economics of the nonprofit firm would suggest that the managers of the firm (the Board of Directors, President of ICANN, and General Counsel) would seek to maximize their individual utilities. ICANN directors receive no direct monetary compensation beyond expenses. Nor is the monetary compensation for ICANN's top management extraordinarily high by nonprofit standards. There is no evidence of rent-seeking behavior by the ICANN management (bribery). Rather, members of the ICANN board and management appear to derive utility from their participation in the ICANN process. But even if ICANN is not a profit-maximizer, there are powerful incentives for ICANN to increase its revenues. The ability of ICANN to carry out its responsibilities under the MOU would be compromised if ICANN lacked sufficient revenues to pay its staff and other expenses. ICANN staff members will seek increased compensation, and ICANN will need to pay competitive wages to avoid losing staff members to other nonprofits, government, and the private sector. ICANN insiders may seek to increase their status, power, and influence within the ICANN community, and ICANN's revenues may directly or indirectly affect ICANN's relative importance.

205. Cal. Corp. Code § 5111; *see also infra* pt. IV(C)(1) (ICANN's Mandate to Serve the Public Interest).

a matter of law. As a matter of political philosophy, the nature of the public interest is, at the very least, contested. That is, whatever the ultimate resolution of philosophical debates about what counts as the public interest, as a practical matter this is a question of which we are unlikely to see a strong social consensus in a modern pluralist democracy.[206] As a matter of law, the obligation to act in the public interest underdetermines ICANN's actions. Undoubtedly, ICANN could make DNS policy in a variety of ways without endangering its status under California law, but there is one thing that ICANN cannot do given its legal status: ICANN cannot operate the DNS so as to maximize its own profits or so as to confer a private benefit on the various stakeholders that participate in the ICANN process.

D. Options for ICANN's Management of the TLD Space

So far, we have provided an outline of the economics of ICANN's root service monopoly. Although some aspects of our account are tentative and other elements may be controversial, we believe several points should be beyond controversy. Among these points are: (1) root service is not a public good in the economic sense; (2) root service is a natural monopoly because of networking effects and cost structure; (3) top level domains are economically scarce. Given these three conclusions, what options are available to ICANN for administration of the TLD space?

In the sections that follow, we will discuss these options in greater depth. At this stage we will simply list some of the alternatives, providing a brief description for each.

1. *A Static Root*—the first alternative is simply to freeze the root, allowing no new slots and no changes in the names of the current slots. A minor variation would be to freeze the number of slots, but allow the slots to be traded on a secondary market, giving new proprietors the right to change the name associated with the slot.

2. *Rule of First Occupation*—the second alternative is a rule of first occupation, with or without a fee. New gTLDs could be registered on a first-come, first-serve basis. Each registrant could be charged an annual or one-time fee that would cover the cost of adding the new gTLD to the root and providing root service for the new gTLD.

3. *Case-by-Case Public Interest Assessment*—a third option is the so-called "beauty contest" approach. ICANN could allow applicants

206. *Cf.* John Rawls, *Political Liberalism* (paperback ed., Columbia University Press 1995).

to come forward with applications for new gTLDs, either in batches, on an annual-basis, or even on an always-open basis. The ICANN board or some subunit of ICANN could then evaluate each proposal, either on its own merits or in comparison with competing proposals.

4. *Lotteries*—A fourth option is to conduct a lottery. For example, each individual or each eligible firm could receive an equal chance in a drawing for gTLD slots.

5. *Auctions*—the final alternative is to conduct gTLD auctions, with or without a fee that covers the cost of root service. We discuss the various auction possibilities in detail below.[207]

These options can be mixed and matched in various ways, but fundamentally, ICANN only has these five choices open to it. So long as ICANN does not operate TLDs itself, ICANN must allocate the scarce root resource through some mechanism. One option (number 1 above) is to waste the root resource by refusing to expand the number of TLD slots. If ICANN rejects this option, then it must allocate the new slots. There are only so many ways this can be done. In the end they boil down to four: auctions, lotteries, queues, and beauty contests—or hybrids of these four.

There is one final dimension of the choice set open to ICANN for making DNS policy. Any of the above options could be combined with technical certification or technical monitoring of registry operators.[208] Operation of a registry (the back end) is not identical with management of a TLD (the front end). Registry operation (at least for the purposes of this paper) is simply performance of the technical functions that enable stable and reliable operation of the name server containing the zone file for the TLD.[209] This function can be contracted to a certified registry operator by the firm or organization that sets the registration policies for the TLD. In the alternative, ICANN could simply monitor registry operation and disqualify operators who create problems. Yet another alternative is

207. *See* Part IV(B) (Competitive Bidding for new gTLDs).

208. *See, e.g.*, Business Constituency, *Business Constituency Position Paper, A Differentiated Expansion of the Names Space* <http://www.bizconst.org/positions/Differentiatednamespace.doc> (Dec. 2002).

209. In most cases, gTLD proprietors also operate their respective registries, but they need not, such as.org. The original registry agreement with Verisign for operation of the .org gTLD expired at the end of 2002. Public Interest Registry, a non-profit corporation created by the Internet Society, was designated by ICANN as the successor operator of .org. However, technical (back-end) operations are provided by Afilias, Inc. *See* ICANN, *Materials on .org Reassignment* <http://www.icann.org/tlds/org> (accessed Oct. 4, 2003); Afilas, *Public Interest Registry Assumes Control of .ORG Domain Name Registry* <http://www.afilias.info/news/press_releases/pr_articles/2003-01-02> (Jan. 2, 2003).

for ICANN to disqualify TLD managers whose registry operators fail to meet technical standards. The point is that there is no requirement that the front end manager and the back end operator be the same entity. Indeed, there are good reasons to believe that the most efficient organizational form for new gTLDs would separate these functions.

Having completed our sketch of the economics of DNS policy at the level of theory, we now move to the realm of practical experience. Fortunately, DNS policy does not need to be made in a vacuum. There is a rich history of telecommunications regulation in the United States. That history is the topic of the next Part of this Article.

III. Comparisons with Telecommunications Policy

In Part II, we provided an abstract analysis of domain name policy from an economic perspective. Here, in Part III, we extend and deepen that analysis by drawing upon lessons learned in the context of telecommunications policy.

A. Introduction to Telecommunications Regulation

In the United States, an independent federal agency, under the direction of Congress, is charged with developing and implementing policies governing the major telecommunications industries. These include broadcast radio and television, wireline and wireless telephony, and video distribution via cable, wireless, and satellite. One might wonder why the Federal Communications Commission ("FCC") does not likewise have jurisdiction, at least in the US, over perhaps the most significant telecommunications industry—the Internet.[210] The FCC's authority does extend over those elements that comprise the Internet "backbone" and connectivity, i.e., the wireline infrastructure and the wires, cables, or wireless frequencies Internet users employ to connect to the backbone.[211] But the agency does not regulate those elements of the Internet which comprise its functions

210. This is not to say there haven't been proposals to put the Internet under FCC jurisdiction. *See, e.g.*, David B. Nash, *Orderly Expansion Of The International Top-Level Domains: Concurrent Trademark Users Need A Way Out Of The Internet Trademark Quagmire*, 15 John Marshall J. Computer & Info. L. 521, 543 (1997).

211. The FCC shares jurisdiction with the National Telecommunications Information Administration (NTIA), an agency of the Department of Commerce (DOC). The NTIA advises the President on telecommunications policy. It also has authority over that part of the spectrum used by the federal government. *See* U.S. Dept. of Com., *National Telecommunications and Information Administration Facts* <http://www.ntia.doc.gov/ntiahome/ntiafacts.htm> (accessed Oct. 4, 2003).

or value. Thus, the fundamental components of the Internet's functionality—the computers, servers, content, architecture, protocols, users, and Internet Service Providers—are not regulated by the FCC or any other governmental body.[212]

This is not an oversight. Deliberate federal policies during the Clinton administration were intended to leave the Internet mostly in private hands and unregulated.[213] As explained by Ira Magaziner, President Clinton's senior policy advisor, "almost two-thirds of the real growth of the U.S. economy [during the mid- and late 1990s] [came] from the Internet economy." Privatization, in the view of the White House, was essential to foster this growth and its transformative effect on the global economy.[214] Thus, while the Internet was developed under the auspices and support of the US

212. Some commentators believe the FCC clearly has jurisdiction over the Internet, but has refrained from exercising it for policy reasons. *See, e.g.*, Joseph P. Liu, *Legitimacy and Authority in Internet Coordination: A Domain Name Case Study*, 74 Ind. L.J. 587, 621 n. 157 (1999).

213. Perhaps most instrumental in this regard were the "white" and "green" papers issued by NTIA. "[A]s part of the Clinton Administration's *Framework for Global Electronic Commerce*" on July 1, 1997, "the President directed the Secretary of Commerce to privatize the domain name system (DNS)...." On Jan. 30, 1998, NTIA issued a request for comments (dubbed the "green paper") on its design to privatize the management of Internet names and addresses "in a manner that allows for the development of robust competition and facilitates global participation in Internet management." *See* NTIA, *A Proposal to Improve Technical Management of Internet Names and Addresses: Discussion Draft* <http://www.ntia.doc.gov/ntiahome/domainname/dnsdrft.htm> (Jan. 30, 1998). NTIA responded to the 650 comments received with its "white paper," issued June 5, 1998, containing a revised "Statement of Policy." *See* NTIA, *Statement of Policy* <http://www.ntia.doc.gov/ntiahome/domainname/6_5_98dns.htm> (June 5, 1998). This recommended the creation of a private corporation for the administration of the DNS, and culminated in a Memorandum of Understanding Between DOC and ICANN. *See* NTIA, *Memorandum of Understanding Between NTIA the Department of Commerce and ICANN* <http://www.ntia.doc.gov/ntiahome/domainname/icann.htm> (accessed Oct. 4, 2003). Additional background documents can be found at NTIA, *Background Documents* <http://www.ntia.doc.gov/ntiahome/domainname/background.htm> (accessed Oct. 4, 2003). For a critique of the "government's lack of transparency in its privatization decisions," *see* Jay P. Kesan & Rajiv C. Shah, *Fool Us Once Shame On You—Fool Us Twice Shame On Us: What We Can Learn From The Privatizations Of The Internet Backbone Network And The Domain Name System*, 79 Wash. U. L.Q. 89, 94 (2001).

214. *See* Ira Magaziner, *At The Crossroads Of Law And Technology: Keynote Address, October 23, 1999*, 33 Loy. L.A. L. Rev. 1165, 1168-73 (2000); *see also* National Telecommunications and Information Administration, *Statement of Policy: Management of Internet Names and Addresses*, 63 F.R. 31741, 31744 (1998) (stating that "the U.S. continues to believe, as do most commenters, that neither national governments acting as sovereigns nor intergovernmental organizations acting as representatives of governments should participate in management of Internet names and addresses").

military, the Department of Commerce, and several funding agencies, post-natal government involvement is mostly noted by its absence.[215]

Regulating the Internet would be a daunting task, and it is not obvious that it would even be feasible for national agencies to regulate effectively.[216] National regulation would likely retard the growth of the Internet, and create more controversy than consensus. Indeed, the few ad hoc regulations that do apply uniquely to the Internet, usually relating to content such as child pornography, spam, or trademarks, have either been unconstitutional, ineffective, or supplemented by private regulation.

While we generally oppose any regime of national government regulation of the Internet, we believe that it both illuminating and instructive to examine regulatory policies in other telecommunications industries as a basis for the formulation and evaluation of Internet policy. There are two principal reasons for doing so. First, the interminable struggle over telecommunication policies elsewhere reinforces the wisdom of leaving the Internet mostly unregulated. Second, those analogous policies have undergone rigorous examination, both for their theoretical soundness and practical efficacy. There is much to be learned from what scholars, regulators, courts and the industries themselves have to say about various policies and principles in telecommunications law.[217]

Aside from the Internet, the two most dominant telecommunications industries, both in the US and worldwide, are broadcast and telephony. Examining these industries allows for comparative analysis of Internet policies, especially those involved in

215. *See* 47 U.S.C. § 230(b)(2) (2000) ("It is the policy of the United States to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation.").

216. Several observers have argued that attempts at national regulation would inevitably fail. *See, e.g.*, Anupam Chander, *The New, New Property*, 81 Tex. L. Rev. 715, 757-58 (2003). In contrast, Richard Hill suggests that a "mix of national and international (via ITU) [regulation] that has worked for all other modes of telecoms" could also work for the Internet. Ltr. From Richard Hill, Counselor, Intl. Telecomm. Union (ITU), Standardization Sector (ITU-T), to Karl M. Manheim, Prof. of Law, & Lawrence B. Solum, Prof. of Law (July 25, 2003) (copy on file with authors). *See also* Clarifications on ITU and ICANN Reform <http://www.itu.int/ITU-T/tsb-director/itut-icann/clarifications.html#notes> (Aug. 21, 2002) (stating that "the ITU believes that all of the world's governments would have to be involved if a mandate to 'make decisions that have public policy implications' were to be agreed").

217. Others have also written about the parallels between ICANN and the FCC, perhaps most notably Jonathan Weinberg at Wayne State University School of Law. Prof. Weinberg was also co-chair of ICANN's Working Group C on Generic Top-Level Domains. *See* ICANN, *Report (Part One) of Working Group C (NEW gTLDs) Presented to Names Council* <http://www.icann.org/dnso/wgc-report-21mar00.htm> (Mar. 21, 2000).

access to the name space. In many ways, the DNS system resembles the radio spectrum because scarcity limits access, thereby requiring a licensing scheme.[218] Scarcity also creates value and markets, which may in turn influence policy formation.

The DNS and IP Address systems also bear similarity to the telephone name and number spaces. Regulation of the latter is accomplished by such familiar conventions as country codes (e.g., 1 for North America), area codes, three-digit prefixes and four-digit suffixes. But resulting value in telephone numbers has lead to ancillary regulation such as information and public safety protocols (411 and 911, respectively) and number portability requirements.

It is to these industries and regulatory policies we now turn, after which we will return to a discussion of the Internet name space and regulation of gTLDs.[219]

B. Two Fundamental Comparisons: Broadcast and Telephone

The Internet is both similar to and different from other communications technologies. In this section, we compare Internet regulation to regulation of the radio spectrum (using broadcast licensing as an example) and to regulation of the telephone system (using telephone number assignment as an example).

1. Broadcast Licensing

Use of the radio spectrum has been subject to a regulatory licensing scheme since shortly after the first commercial applications of radio emerged.[220] Licensing is premised on the theory that the spectrum is "a valuable and limited public resource."[221] Whether it is

218. We do not intend to take a position on the controversial question whether there is true scarcity in spectrum, given current broadcasting technologies. Whatever the current status of that issue, the historical evolution of broadcast regulation was based on a premise of spectrum scarcity.

219. This subsection is mainly descriptive; it lays the foundation for some basic policies. Later sections will be more normative; we will critique those policies and examine their relevance to the development of Internet policy.

220. *See* Radio Act of 1912, Pub. L. No. 62-264, ch. 287, 37 Stat. 302 (1912). The first federal law concerning radio transmission was the Wireless Ship Act of 1910, Pub. L. No. 61-262, ch. 379, 36 Stat. 629 (1910).

221. *Columbia Broad. Sys., Inc. v. Democratic Natl. Comm.*, 412 U.S. 94, 101 (1973); *see also FCC v. League of Women Voters*, 468 U.S. 364, 376 (1984) (describing the spectrum as a "scarce and valuable national resource"). Public ownership of the spectrum was assumed as far back as the Radio Act of 1912. The precept was reiterated in the Communications Act of 1934, which provides the current framework for telecommunications regulation in the United States. *See* 47 U.S.C. § 301 (2000) ("It is the purpose of this chapter, among other things, to maintain the control of the United States

also a public good, as we have used that term, depends on which good and whose consumption is analyzed. Several different interactions and groups of users are involved in the commercial broadcast industry: broadcasters (station owners), listeners and viewers, program content suppliers, and advertisers. The first two groups are most instructive for present purposes.[222] As we next show, the frequencies used for transmission (analogous to domain names) are private goods, while the information contained within the transmissions (analogous to web content) are public goods.

The spectrum is an intangible construct. It is a convenient way to describe the physical transport of energy using electromagnetic waves. It is a means of information delivery, not a commodity or resource that can be "used up" in any physical sense. Yet, in economic terms, the spectrum can support only so many channels of information at any one time. The number of channels is dependent on the state of technology and on social preferences such as clarity of reception and privacy concerns. Since this article is about economic and welfare policies, not about engineering, we will assume there is a limited supply of useful spectrum which can be "consumed" by use.[223] If there were no limit on supply, there would be no need to develop allocation policies. In the case of radio frequencies there is a limit, albeit more of an artificial than technological nature. In either case,

over all the channels of radio transmission; and to provide for the use of such channels, but not the ownership thereof, by persons for limited periods of time. . . ."). The notion that the spectrum is public property has not gone unchallenged. *See, e.g.*, Milton Mueller, *Property Rights In Radio Communication: The Key To The Reform of Telecommunications Regulation*, Cato Institute, June 3, 1982 ("[C]haracterization of the electromagnetic spectrum [as a public resource] is fallacious and misleading. The spectrum is not a 'natural resource'; it does not even exist independently of specific transmitters and receivers. . . There is no 'spectrum,' then; there are only transmitters and receivers of electromagnetic energy.").

222. Both content suppliers (e.g., studios, record companies) and advertisers market "private goods" to broadcasters as well as to other communications and non-communications industries. By virtue of copyright and licensing, consumption of programming by broadcasters is usually rivalrous and exclusive. Advertising is also rivalrous and exclusive, but in the opposite direction. Advertising spots consume broadcast time, and advertisers are excluded from spectrum use unless they buy airtime from broadcasters.

223. Recent technological advances seriously undermine the notion of spectrum scarcity, at least in the physical or engineering sense. As interference and simultaneous use problems get worked out by advanced technology, many of the regulatory precepts that have sustained FCC licensing for nearly a century need to be reexamined. *See* Stuart Minor Benjamin, *The Logic of Scarcity: Idle Spectrum as a First Amendment Violation*, 52 Duke L.J. 1 (2002). But, for the same reasons that domain names are scarce, despite unlimited engineering capacity, radio licenses are scarce even if the concept of spectrum scarcity is no longer valid in a physical sense.

limited supply creates scarcity; scarcity creates a need for allocation. The question at hand is whether scarce communication resources should be allocated by government regulation or by the market.

Broadcasters "consume" spectrum in order to deliver information and services to others. In economic terms, spectrum resembles a private good because it is rivalrous; i.e., use by one consumer (broadcaster) diminishes the supply for others.[224] If broadcaster A transmits on a frequency of 101 MHz, that frequency is no longer available for others (in the same geographic region and at the same time),[225] at least not without rendering both signals worthless. That is because multiple signals on the same frequency will interfere with one another;[226] receiving devices will be unable to distinguish the signals and produce meaningful video or audio.[227] Indeed, it was the unregulated cacophony of voices transmitting on same or nearby frequencies in the 1920s that lead to the well-known "tragedy of the commons," rendering the radio spectrum mostly unusable.[228]

224. We refer to "consumption" of the spectrum in economic not physical terms. While transmission itself does not deplete the supply of spectrum (an infinite number of transmissions can occur simultaneously on the same frequency), it does impede multiple use to transmit information. "It is the phenomenon of interference that gives rise to scarcity in radio communication." Mueller, *Property Rights In Radio Communication, supra* n. 221.

225. The radio spectrum can be described in three dimensions: frequency, geography and time. If any one of these differs between transmitters, interference should not arise. Thus, there are many ways that frequencies can be "re-used" by multiple parties, the most common of which is geographic separation of limited-range transmitters. Time division (akin to time-sharing of condominiums) is another. Although this was employed mostly in the early days of radio, this practice can still be found, especially for AM broadcasts. *See* Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast Spectrum*, 33 J.L. & Econ. 133, 147-48 (1990). AM signals travel further at night, so secondary licenses yield to clear-channel licenses on the same frequency either by not transmitting or reducing power at night.

226. Radio signals on the same frequency combine to produce undesired modulation, which confuse reception devices. In signal terminology, interference causes information loss in most of the technologies commonly used.

227. This is only partially true. Modern technologies such as multiplexing and phase discrimination permit multiple simultaneous uses of the same frequency for separate transmissions. For clarity, however, we will assume that only a single signal can be transmitted locally at any one time on a particular frequency. Even multiplexing has a finite capability, so a more accurate treatment would merely move the analysis one step further into the physical description that follows. For a discussion of how multiplexing affects the scarcity rationale, see Gerald R. Faulhaber & David Farber, *Spectrum Management: Property Rights, Markets, and the Commons*, 2002 Proc. Telecomm. Pol'y Res. Conf. (forthcoming) <http://rider.wharton.upenn.edu/faulhabe/SPECTRUM_MANAGEMENTv51.pdf> (accessed Nov. 15, 2003).

228. *See Red Lion Broad. Co. v. FCC*, 395 U.S. 367, 375-76 (1969).

The rivalrous nature of the spectrum arises only if there is a limited supply.[229] If there were no upper or lower limit on frequencies usable for transmitting information, an infinite number of broadcasters could operate simultaneously, so long as there was compatibility between transmission and reception devices. We know there is a lower limit on frequencies–something near to zero cycles per second—but there may not be an upper limit.[230] Consumer electronics devices operating in the gigahertz range (billions of cycles per second) are now commonplace; the terahertz range (trillions of cycles per second) is not far behind.[231] Using current technologies, we could allocate at least a million broadcast channels of 10 KHz each (the bandwidth of AM broadcast licenses) in every metropolitan area.[232] That's more than enough to fully eliminate "spectrum scarcity." Indeed, the FCC could give every person in the United States his or her own broadcast license.[233]

Of course this would never happen. First, there are competing uses for the frequencies, such as other broadcast needs, public safety, and wireless telephony. Second, and more importantly, "spectrum scarcity" is not altogether a bad thing. Scarcity created by regulation gives rise to excludability, which creates value; it turns what might otherwise be a public good into a private good. Accordingly, scarcity is not a *problem* for the radio industry, it is an *opportunity*. So as to preserve vested positions, early proposals to expand the AM band

229. Information capacity of the radio spectrum is determined by Shannon's algorithm. *See* Michael P. Frank, Thesis <www.cise.ufl.edu/~mpf/papers/Frank/Frank-94/ftp/ps/Thesis.ps> (accessed Mar.18, 2003).

230. Quantum physics imposes both upper and lower limits on wavelength and accordingly on frequency. But these can be disregarded for present purposes.

231. Terahertz transmissions are already in use for laser and other optical communications. *See, e.g.,* Ed Gerstner, *Filling the Terahertz Gap* and Rüdeger Köhler et al., *Terahertz Semiconducting-heterstructure Laser*, <http://www.tqc.iu.edu/News/THz_laser.htm> (Feb. 16, 2001). At least one company is working on terahertz and sub-terahertz radios. *See* Endwave, News Release, *Endwave's Doug Lockie to Lead Workshop at the Broadband Wireless World Forum* (Feb. 16, 2001), <http://www.endwave.com/News_PR021601.html> (Nov. 6, 2002).

232. 1,000,000 times 10KHz equals 10 Gigahertz of bandwidth. Leaving adjacent channels empty to avoid interference, 20 GHz of total bandwidth would be needed. This is less than is currently used by the various categories of radio devices. The FCC currently regulates radio transmissions in frequencies as high as 200 GHz. See 47 CFR § 15.255.

233. Assuming a 100 mile separation between licenses for the same and adjacent frequencies (to avoid interference), and assuming uniform geographic distribution, more than 4,000 licenses could be issued in the US for each frequency. That yields 400 million separate licenses. In actuality, at the end of fiscal year 2002, there were 4,804 AM broadcast stations in the United States. *See* Federal Communications Commission News, *Broadcast Station Totals as of September 30, 2002* <http://www.fcc.gov/mb/bureau_chief/fy2002st.doc> (Nov. 6, 2002).

(only 5 percent of usable spectrum had been allocated to broadcast), and eliminate scarcity, were rejected as "dangerous" "pernicious," and "fatuous."[234] The history of spectrum allocation in this country is one of favoring powerful constituencies by giving them exclusive rights to generate monopoly rents.

However, to the extent scarcity promotes innovation and investment,[235] its preservation may be justified by public policy, if not by necessity.[236] Herein lies one lesson that broadcast can offer for regulating the domain name space: not all scarcity follows the model of a scarce physical resource, such as land or water. Scarcity can be a function of architectural decisions and engineering. Because excludability can be created by legal regulation, a legal regime can create economic scarcity.[237] Whether to enforce scarcity, and to what extent, depends on the social benefit of having fewer rather than greater numbers of users. This in turn depends on an economic and social welfare analysis of the good or service. We will return to this analysis below.[238] But one thing is certain: scarcity in frequencies, as in domain names, is intentional and cannot be justified on technical grounds.[239]

The rivalrous nature of the radio spectrum arises from the interaction of physics and regulation. Two signals at the same frequency can interfere—that is physics. The FCC historically allocated spectrum by granting licenses to broadcast within a band or range of frequencies—that is regulation. Excludability also arises from a combination of physics and regulation. The law can grant an exclusive license to broadcast at a particular frequency in a specified

234. Hazlett, *The Rationality of U.S. Regulation of the Broadcast Spectrum*, *supra* n. 225, at 154-55.

235. Licensees of scarce frequencies can enhance their value by innovating new technologies that allow a greater number of uses or users per channel.

236. Scarcity also justifies heavy regulation to promote "the public interest." Indeed, scarcity is the basic premise of the Communications Act of 1934. *See* Glen O. Robinson, *The Federal Communications Act: An Essay on Origins and Regulatory Purpose*, in *A Legislative History of the Communications Act of 1934* (Max Paglin ed., Oxford U. Press1989). Scarcity is also the rationale for content regulation on the airwaves. *See* Benjamin, *The Logic of Scarcity*, *supra* n. 223, at 38-45.

237. So, for example, the patent laws can create economic scarcity in licenses for patented inventions or the copyright laws can create economic scarcity in copyrighted writings. Although consumption of information itself is nonrivalrous (my copying a book does not deprive you of your ability to copy the same book), legal exclusion (e.g., a legal prohibition on copying) results is the tangible embodiment of the information (e.g., the book itself) becoming the relevant scarce economic good.

238. *See infra* pt. IV(A) (A Proposed Model for Expansion of the Name Space).

239. For a discussion of the history of spectrum scarcity, *see generally* Hazlett, *supra* n. 225, at 133-35.

geographic region. Physics makes it possible to detect violators, and limits the geographic range of particular broadcasters—at least in certain parts of the spectrum. Regulation is required, because broadcaster A's transmission on 101 MHz does not by itself prevent broadcaster B from using the same frequency. Indeed, it is nearly impossible to exclude access to the spectrum for transmission through technological means.[240] So exclusion requires some legal regime, and the current regime is licensing.[241] It is a regime that is sometimes difficult to enforce, as evidenced by the proliferation of "pirate" radio stations broadcasting at various times, often from off-shore locations transmitting to coastal and border areas.[242] However, because of the large investments typically necessary to erect studio and transmission facilities, illegal unlicensed broadcasts are rare.[243]

As shown above, without exclusion, the spectrum is potentially worthless—interference might prevent anyone from making use of the resource. Accordingly, spectrum policy in the United States turns a public good (nonrivalrous use of technologically unlimited, and not

240. The Soviet Union tried this by "broadcasting noise, programming, or any other source of interference on the same frequency as a signal. During the Cold War, this technology was used by the Soviet government to prevent American radio signals from reaching its citizens." *See* Maggie Parsons, *United States International Broadcasting Services During the Cold War*, <http://iml.jou.ufl.edu/projects/Spring2000/Parsons/cold.htm> (accessed Mar. 26, 2003).

241. Section 301 of the Communications Act of 1934 states: "No person shall use or operate any apparatus for the transmission of energy or communications or signals by radio [except under a license] . . .granted under the provisions of this chapter." 47 U.S.C. § 301 (2001). Any person convicted of violating § 301 shall "be punished . . . by a fine of not more than $10,000 or by imprisonment for a term not exceeding one year." 47 U.S.C. § 501 (2001).

242. *See, e.g., Pirate Radio Central* <http://www.blackcatsystems.com/radio/pirate.html> (accessed Feb. 24, 2003); *The Free Radio Network*, <http://www.frn.net> (accessed Oct. 27, 2002); *The Offshore Radio Guide* <http://www.offshore-radio.de/index.html> (accessed Feb. 24, 2003); *alt.radio.pirate Newsgroup FAQs* <www.faqs.org/faqs/by-newsgroup/alt/alt.radio.pirate.html> (accessed June 23, 1998).

243. This discussion applies only to the licensed portions of the spectrum. Many bands (called "public frequencies") are unlicensed. These bands are carved out of the general licensing scheme to enable short range devices such as cordless phones and television remote controls. Lately, public frequencies have been put to other telecommunications uses such as IEEE standard 802.11, commonly referred to as "WiFi." Some of these operate over longer ranges and congested areas of the spectrum. The ability of otherwise competing and interfering uses to coexist on public frequencies is a consequence of technological advance. The relevance of these public frequencies to the formation of access policies will be explored later, but for the time being, it is useful to observe that radio transmissions are generally prohibited unless licensed.

easily excludable frequencies) into a private good. Both spectrum scarcity and exclusion are artifacts of regulatory policy.[244]

Licensing policy requires an elaborate bureaucracy (and compliant courts) to implement and enforce. The Media Bureau (formerly Mass Media Bureau) processed roughly 5,000 license applications in 1999.[245] The bureau receives a good portion of the FCC's annual appropriations, which totaled 278 million dollars for fiscal year 2003.[246] These are considerable public resources devoted to the preservation and regulation of private goods.

Unlike the frequencies used for transmission, the content of broadcasts is a classic public good. Over-the-air radio and television signals are both nonrivalrous and nonexcludable—or at least were before the advent of encryption technologies. They are nonrivalrous because consumption (reception) by any number of listeners or viewers does not degrade the signal or deplete its content. Broadcast signals are ordinarily nonexcludable, because it is difficult to keep non-paying listeners and viewers from enjoying the broadcast.[247] Of course, both analog and digital signals can be encrypted as a means to charge for access,[248] but the FCC generally discourages such

244. Spectrum policies are constantly under review and subject to debate. In fact, a recent FCC report discussed a possible spectrum policy that would abandon the current regulatory and exclusivity model in favor of a "commons" or "open access" model. *See* Fed. Commun. Comm. Spectrum Policy Taskforce, *Report of the Spectrum Rights and Responsibilities Working Group*, <http://www.fcc.gov/sptf/files/SRRWGFinalReport.pdf> (accessed Nov. 15, 2002).

245. *See* Federal Communications Commission Before the Subcomm. On Commerce, Justice, State, and the Judiciary, Comm. on Appropriations, U.S. Senate, on the FCC Fiscal Year 2001 Budget Estimates (*statement of William E. Kennard, Chairman, Fed. Commun. Comm.* <http://www.fcc.gov/Speeches/Kennard/Statements/2000/stwek022.html> (accessed Oct. 2003).

246. *See* Office of Mgmt. & Budget-Executive Office of the President, *Budget of the United States Government, Fiscal Year 2003* <http://www.whitehouse.gov/omb/budget/fy2003/pdf/app31.pdf.> (accessed Oct. 2003). Much of this is offset by the recent practice of auctioning broadcast and other licenses.

247. It is harder to license radio reception than it is to license broadcast, but not impossible. In England, for instance, owners of television sets pay a user fee that supports public broadcasting (BBC). Unlicensed receiving devices are detected by roving trucks that analyze electromagnetic field characteristics as they pass homes and other structures. *See* BBC, *New Generation of Television Detector Vans Hit the Streets* <http://www.bbc.co.uk/pressoffice/pressreleases/2003/06_june/24/licensing-detector.vans.html> (June 24, 2003).

248. These are technological means of creating excludability. For example, broadcast signals could be encrypted and the limited-duration decryption keys could be sold to customers. A similar system is used to create excludability by cable operators (who find encryption and set-top decryption devices less expensive than physically cutting the cable link to particular locations).

practice.[249] This is what keeps over-the-air broadcasts "free." Indeed, the provision of free radio and television content is a basic tenet of FCC policy and drives many of its decisions, such as the requirement that television tuners be capable of receiving digital over-the-air signals by 2007, despite the fact that most Americans receive their home video signals via subscription services (cable or satellite) that bypass TV tuners entirely.[250]

In analyzing licensing and domain name policies from an economic or public policy perspective, it is important to focus on the right commodity and corresponding facet of the industry. It is not consumption of broadcast content that is relevant here. Thus, the fact that from their perspectives, listeners and viewers are consuming a public good is immaterial. Rather, it is the consumption of frequencies by broadcasters that is the relevant transaction and frames the debate. Correspondingly, consumption of web content by Internet users (a public good) is not what drives gTLD policy-making. Rather, it is the consumption of gTLDs within the domain name space (a private good) that matters. Thus, we focus on allocation of spectrum and gTLDs, not on user access to transmitted information.

Although the distinction between providers and end users is an important one for economic and policy analysis, it is a distinction often overlooked. Indeed, the Supreme Court has gotten it wrong. In *Reno v. ACLU*,[251] the Court invalidated the Communications Decency Act of 1996 as infringing on Internet users' free speech rights. It distinguished the broadcast industry, where speech restrictions had been upheld partly on a theory of spectrum scarcity. "[U]nlike the conditions that prevailed when Congress first authorized regulation of the broadcast spectrum, the Internet can hardly be considered a 'scarce' expressive commodity . . . as many as 40 million people use the Internet today."[252] This statement[253] mixes apples and oranges.

249. Direct viewer payment for television programs ("pay TV") first started in the 1920s and experienced a resurgence in the 1970s. *See* Megan Mullen, *Pay Television*, <http://www.museum.tv/archives/etv/P/htmlP/paytelevisio/paytelevisio.htm> (accessed Feb. 25, 2003). Currently the FCC permits subscription-based television only for ancillary broadcasts on a digital license. *See* 47 C.F.R. § 73.642 (2002).

250. Fewer than 10 percent of American households obtain their television signals by free over-the-air reception. *See* The Examiner, *Digital TV, that's an order* <http://www.examiner.com/headlines/default.jsp?story=n.digital.0809w> (Aug. 9, 2002). Approximately 82 percent subscribe to a multichannel service such as cable or satellite. *See* J.D. Power and Associates, *J.D. Power and Associates Reports: Satellite TV Grows in Consumer Popularity, Cable Service Sees Slight Decline.* <http://www.jdpa.com/studies_jdpower/pressrelease.asp?StudyID=654> (Sept. 5, 2002).

251. 521 U.S. 844 (1997).

252. *Id.* at 870.

Spectrum scarcity in broadcast refers to the limited number of providers that can operate simultaneously, not the number of persons who can receive transmissions. Comparing broadcast providers with Internet end users misses the scarcity point entirely.[254] It also confuses private and public goods.[255]

As suppliers of a good or service, broadcasters are analogous to registrants and information providers. The former consume spectrum, while the latter consume domain names, and IP addresses.[256] In the case of spectrum, economic scarcity results from engineering decisions and regulatory policy. In the case of domain names, scarcity results from precisely the same factors plus the networking effects that create a natural monopoly in a single authoritative root.[257] In the case of IP addresses, scarcity is dictated by the communications protocol, TCP/IP, which limits the number of possible IP addresses. In none of these cases is scarcity the inevitable result of physical limitations.[258]

Whether spectrum scarcity is a bane or benefit, some mechanism must be devised for allocating access. As it turns out, this has been the most complex and contentious element of telecommunications policy for nearly a century. At the international level, frequency use

253. Because this statement does not provide an essential supporting reason for the holding in *Reno*, it is *obiter dictum*.

254. The Court might have compared use of the spectrum by broadcast providers with use of the DNS by Internet providers. Had it said the former was scarce because of the limited number of simultaneous broadcasts feasible on allocated spectrum, but the latter was not due to the greater number of unique domain names available, we would nonetheless take issue with the Court's conclusion. But at least it would have been speaking of comparable commodities. Instead, the Court compared broadcast providers with Internet end users. The former consume scarce resources; the latter do not.

255. There is a way in which consumption of information content on the Internet is rivalrous. Internet users consume bandwidth. Although there is enormous capacity, it is not unlimited. Hence congestion occurs. In most instances, internet usage is not metered, leading to the potential of misallocation and waste. Thomas Hazlett gives this gross example: "the brain surgeon cannot read the life-or-death CT-scan because the Internet backbone is clogged with junk e-mail." Thomas W. Hazlett, *The Wireless Craze, the Unlimited Bandwidth Myth, the Spectrum Auction Faux Pas, and the Punchline to Ronald Coase's "Big Joke": An Essay on Airwave Allocation Policy*, 14 Harv. J.L. & Tech. 335, 491 (2001). Issues concerning bandwidth allocation and quality of service are simply outside the scope of our inquiry in this Article.

256. For an excellent background discussion of IP Address allocation, see John C. Klensin, *A Policy Look at IPv6: A Tutorial Paper* <http://www.itu.int/itudoc/itu-t/com2/infodocs/015.html> (accessed Dec. 12, 2003).

257. *See supra* pt. II(C) (Networking Effects and the Root Service Monopoly).

258. A similar comparison can be made of listeners/viewers and Internet users. From the perspective of each, the telecommunication service is a public good. Consumption is non rivalrous and non excludable, at least without using some technological filter.

has required treaties because radio signals do not respect national borders. At the domestic level, allocation policies have involved each of the three branches of the federal government. And within the economy of telecommunications, scarcity has played an important role in innovation, investment decisions, and prosperity. Indeed, rapid flux in bandwidth capacity (a corollary of spectrum scarcity) has both created and broken industries.

Our concern here, however, is how the FCC has managed spectrum scarcity. The history of spectrum management, as well as current licensing policies, can be instructive to the analogous managerial role of ICANN when it comes to gTLD policies. We will return to this after a brief discussion of another telecommunications industry—telephony.

2. Wireline Telephony

As with broadcast use of the spectrum, whether the telephone system comprises a private or a public good depends on whose use and what aspect is being analyzed. In this section we conclude, as we did above for broadcast rights, that telephone number assignments are private goods. At one level, this is easy to see. Consumption of telephone numbers is rivalrous; if consumer A has a particular number, it cannot also be assigned to consumer B. Consumers are also excluded from telephone services or the network entirely, unless they pay for required goods and services. However, there are differences between the spectrum and modern telephone networks that require further analysis before we conclude that both provide points of comparison for the domain name system.

The physical infrastructure that comprises the Public Switched Telephone Network (PSTN), and forms the backbone of wireline telephone services, differs from the radio spectrum (the backbone for radio transmissions) in at least two relevant respects. First, even with limited technology, there need be no interference from simultaneous wireline uses. An unlimited amount of wire can be laid and an unlimited number of conversations can occur. The commercial history of the telephone industry shows that whenever new demand arose, telephone companies simply laid more cable.[259] Still, wireline is scarce in the economic sense. Expansion of the wireline infrastructure consumes physical resources (such as copper and silicon) and requires human labor. Thus, wireline (the medium for old-fashioned telephone

259. *See* ITSMA, *e-services: delivering the promise of e-business* <http://www.itsma.com/News/itsmainthenews/1218SER_ITS.pdf> (accessed Oct. 2003).

communication) is scarce in a different sense than spectrum (the medium for broadcast communication), but they are both scarce.

Second, the PSTN is entirely privately owned. Whereas the radio spectrum was early conceived as "public property," thereby imposing public trust obligations on its users, telephone lines are created and maintained by private for-profit entities.[260] Telephone companies ("telcos") do provide an economic benefit to the public because of the social and economic intercourse that depends on them. In this sense, telcos are "public utilities" similar to energy and transportation companies, and they are commonly regulated for the same ends (and often by the same agencies—state public utilities commissions).[261] The common goals are fair, non-discriminatory and universal service to all who seek access.[262]

In this sense, the Internet more closely resembles the telephone system than broadcast because the most basic communications layer is privately owned. Indeed, there is substantial overlap since the Internet backbone is mostly owned by the large telcos.[263] However, for the purpose of evaluating domain name policies, the relevant analogy is not to the physical transmission layer of the telephone system; instead, we focus on the analogy between IP addresses and domain names on one hand and the telephone numbering system on the other hand.

In contrast to the privately owned wireline backbone, the telephone numbering system is often said to be a "public resource." As with the spectrum, the telephone number system is, in a sense, a

260. This wasn't always the case. The Electric Telegraph to the Pacific Act (1860) authorized a contract to construct a government telegraph system to "be open to the use of all citizens of the United States during the term of the said contract, on payment of the regular charges for transmission of dispatches." Pub. L. No. 137-138 § 1, 12 Stat. 41, 42 (1860). Nor was private ownership common among countries establishing national telephone networks during the first half of the 20th Century. State-owned post, telephone and telecommunication organizations were the rule. *See* Francis Fukuyama & Caroline S. Wagner, *Information and Biological Revolutions: Global Governance Challenges—Summary of a Study Group* <http://www.rand.org/publications/MR/MR1139/MR1139.chap3.pdf.> (2000).

261. Samuel Morse may have first suggested that telegraph systems be considered "public utilities." *See Regulation and Deregulation of Telecommunications* <http://media.colorado.edu/telecom/paper.htm> (accessed Feb. 25, 2003).

262. Similarly, to the extent telcos are monopolies, they are price regulated as are other public utility monopolies such as natural gas.

263. *See* Nancy Weil, *Who Owns the Internet* <http:www.e-gateway.net/infoarea/news/news.cfm?nid=407> (Mar. 3, 2000) (discussing ownership by ATT, GTE, Global Crossing, Qwest, and PSINet).

mathematical construct.[264] Because it might seem that no one can "own" a number or a wavelength, they are perceived as "belonging" to the public at large.[265] However, even if this view is valid in the abstract, it does not mean that telephone numbers are public goods. The public resource that is the telephone numbering *system* is, in economic terms, a private good when it comes to telephone number *services*: i.e., assigning individual numbers. Because these points are important when comparing them to the domain name system and domain names, let us explore them further.

As with the domain name system and the broadcast spectrum, the telephone numbering system looks like a public good from the point of view of the end user making a phone call. Although multiple users may not be able to simultaneously connect to the same phone number without receiving a busy signal, Ben's use of a particular string of numbers to reach Alice's phone does not preclude Cathy from using the same string for the same purpose. Consumption of the numbering system by end users is nonrivalrous. Although one might attempt to charge a separate fee for use of phone numbers, there would be no economic point in doing so. Indeed, the whole point of

264. There is, however, a difference. Whereas electromagnetic frequencies are not artificial in the sense that the broadcast spectrum involves natural properties of electromagnetic radiation, the telephone numbering system is artificial, in the sense that it was created by the design of the wireline infrastructure. Scientists could measure signals at various frequencies, even if Marconi had never invented radio broadcasting, but there would be no equivalent phenomenon (no natural telephone numbers) to investigate if Bell had not invented the telephone.

Moreover, the way in which the spectrum is used for communication is a function of the devices that utilize the natural properties of electromagnetic radiation to communicate information over a distance. Thus, broadcasts can use either amplitude modulation (AM) or frequency modulation (FM). More recently, devices that utilize tiny slides of a wide band of the spectrum (spread spectrum) have become familiar to consumers in the form of cordless phones that use gigahertz frequencies. Even more advanced devices can opportunistically hop between various frequencies to utilize less noisy portions of the spectrum to communicate a signal. Because the way the spectrum is used to communicate is entirely a product of the technology of communication devices, the particular form in which the spectrum is allocated is a product of engineering—just as the telephone numbering system is the product of engineering.

265. It would have been possible for broadcast spectrum to have been allocated on the basis of a rule of first occupation. It might have been possible for the broadcast communication to have developed based solely on technological solutions to the problem of signal interference. Or it is possible that without regulation, a private regime of cooperation would have emerged. These possibilities never materialized. Instead, it was assumed that the broadcast spectrum belongs to the public at large—as a public resource. A similar assumption has been made with respect to the telephone numbering system, which is treated by FCC regulation as a public resource. *See In the Matter of Administration of the North American Numbering Plan*, 11 FCC Rcd 2588, 2591 (F.C.C. 1995) (neither carriers nor subscribers "own" their telephone numbers).

having a phone number is that everyone with access to the system can reach your phone if you pay the listing fee. The numbering system could be viewed as nonexcludable.[266] Moreover, once Ben has a phone number, he can give the number away and (like other information) it can be copied or distributed. When we dial a phone number, the numbering system might appear to be a public good.

From the point of view of subscribers, however, telephone numbers are private goods. If Ben's telephone number is 1.800.555.1212, then that cannot also be Alice's number. Ben's consumption of the number precludes Alice's use. Therefore, telephone numbering service is rivalrous. Numbering service is also excludable. If Ben doesn't pay his telephone bill, then his telco can suspend his number and exclude him from the system. Because telephone numbering service meets the economic criteria of rival consumption and excludability, numbering service is a private good.

Given an interconnected wireline network, there can only be one numbering system for that network. Like IP Address numbers, telephone numbers perform a routing function.[267] There must be a unique number for each phone on the system for routing to take place. There could, of course, be multiple wireline networks, but if those networks are to interconnect, then each phone on the interconnected network must have a unique identifier. Somehow, there must be a system for allocating unique identifying numbers to each phone on the network. Given the way telephony works, there simply cannot be competing numbering services.[268] Accordingly, there must be a single authority that creates the equivalent of numbering domains and authorities within each domain that allocate numbers to

266. Because of the nature of the telephone system, even persons making a call can be excluded from the numbering system if they refuse to pay a fee. Because, however, there is no reason to separate out the fee for use of the wire from the fee for use of the numbering system, users may not perceive that they in fact are charged for both. The routing functions, however, do not operate in a similar fashion. *See* International Telecommunications Union, *A policy look at IPv6: Tutorial Paper* <http://www.itu.int/itudoc/itu-t/com2/infodocs/015.html> (Apr. 18, 2002).

267. *See generally* United States Department of Transportation, *Call Routing and Its Implications for 511* <http://www.its.dot.gov/511/PDF/Call_Routing.pdf> (accessed Feb. 7, 2004) (describing the routing of telephone calls on PSTN and wireless networks).

268. Of course, it might be technologically possible to create competing systems that translate numbers entered by consumers into different routing numbers actually used by the system. Such a system would be analogous to the role the DNS plays with respect to IP Addresses. Individual consumers could then purchase numbers from firms that provided these second-order numbers. But for reasons we have already explored with respect to the DNS, we would expect that users would converge on a single second-order numbering system. *See supra* pt. II(C) (Networking Effects and the Root Service Monopoly).

firms operating within the domain. The authority must then allocate telephone numbers; the allocation method could be first occupation, geographic classification, a lottery, an auction, or some other method.

Like the Internet, the telephone numbering system is international. At the top level of the system are the country codes (analogous to the ccTLDs). These are assigned by the International Direct Distance Dialing (IDDD) system. The United States, Canada and some Caribbean nations are part of the North American Numbering Plan (NANP). The IDDD code for NANP countries is 1. Within the NANP, telephone numbers consist of a region or access code (3-digit area code), a central office or exchange prefix (3 digits), followed by a 4-digit station number.[269] Thus, a unique 11-digit string is assigned to each end-user device on the PSTN.[270]

Since the country code "1" is the same for all telephones within the NANP, the addition of this digit does not increase the supply of available unique numbers within the domain. The number of available numbers within the NANP is 10^{10}, or 10 billion, assuming each digit 0-9 is usable at each location on the 10-digit string. The assumption is false—for instance there are no area codes or exchange prefixes beginning with 0 or 1[271]—but there are still several billion possible telephone numbers.[272] Approximately 500 million numbers

269. The numbers take the form NXX-NXX-XXXX, where N is any digit 2-9 and X is any digit 0-9. The first string constitutes the Numbering Plan Area (NPA), and the 3 digits representing those areas are referred to either as Numbering Plan Area codes or area codes. The second string is the Central Switching Office Designation. The last string is the Subscriber Line Identifier. See LincMad, *Future Expansion of the NANP* <http://www.lincmad.com/future.html> (July 9, 2001).

270. Most U.S. telephone numbers from the 1920s through the mid1950s contained between two and five digits, the first two of which often corresponded to place names (as in the 1960 movie classic "Butterfield 8"). *See* <http://movies.yahoo.com/shop?d=hv&id=1800042806&cf=info&intl=us> (accessed Feb. 7, 2004). These gave way by 1980 to a seven-digit "all number calling" (ANC) system. *See* Ted Byfield, *DNS: A Short History and a Short Future* <http://www.firstmonday.dk/issues/issue4_3/byfield> (accessed Feb. 25, 2003). The ten-digit scheme was adopted by AT&T in 1947. Now, telephone numbers convey both network routing and billing information.

271. However, the FCC is considering whether to allow this. *See* Second Report And Order, *In the Matter of Number Resource Optimization*, FCC 00-429, (Dec. 7, 2000), ¶¶ 100-106; 14 F.C.C.R. 10322, 10376, ¶ 123. There are other exclusions such as Easily Recognizable Codes (ERC) —an area code or exchange where the last two digits are the same, e.g., 411. *See* NANPA, *NPA Information: Area Codes*, <http://www.nanpa.com/area_codes/index.html> (accessed Apr. 2, 2003).

272. *See* Industry Numbering Committee (INC), *North American Numbering Plan (NANP) Expansion Reference Document*, <http://www.atis.org/pub/clc/inc/nanpe/02072930.doc> (accessed Aug. 16, 2002). Approximately 600 area codes are available with slightly less than 8 million numbers per area.

are currently in use in the United States so there should be ample supply,[273] but there isn't.

Instead, scarcity in telephone numbers is a perennial problem. This is most apparent within individual area codes, where the arithmetic supply of phone numbers is 10^7, or 10 million, per area. The actual supply is less, both because some numbers are reserved[274] and because telcos acquire numbers in large blocks which limits their availability to customers.[275] Even a full ten million numbers are inadequate in major metropolitan areas such as Los Angeles and New York, especially given the explosion of multiple lines for fax machines, modems, pagers and cellular telephones.[276] Given that reality, the division and proliferation of area codes is now a common phenomenon.[277] The number of area codes nationwide doubled between 1991 and 1999.[278] It took only two years, however, for the

273. *See* FCC, *Number Resource Utilization in the United States as of December 31, 2001*, Aug. 2002 <http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/utilizationdec2001.pdf> (Aug. 2002). A total of 1.2 billion numbers are in use, reserved, or available. *Id.* at 13.

274. The numbers 5, 7 and 9 are also often reserved for special use because they have no vowels associated with them on the keypad. *See* Byfield, *supra* n. 270.

275. *See* H.R. Comm. on Energy and Commerce, *Area Code Exhaustion: What are the Solutions?*, Before the Subcomm. On Telecomm. and the Internet, 107th Cong. (Test. of Loretta Lynch, President, California Pub. Util. Comm'n) <http://energycommerce.house.gov/107/hearings/06262002Hearing606/Lynch1023.htm> (June 26, 2002) (Telephone companies receive numbers in blocks of 10,000, even when they have only 500 customers).

276. A typical telephone "power user" might have 5 unique numbers, or more, corresponding to a primary home line for voice calls, a secondary home line for fax and modem, a dedicated business line, a paging number, and a number for her cell phone. Unified messaging services such as voice mail and electronic fax, as well as intelligent transportation systems (e.g., "OnStar"), ATMs, and credit card machines, also use telephone numbers. Mobile telephones are probably the greatest single cause of growing number scarcity. The International Telecommunications Union (ITU) estimates that sometime in 2001 the worldwide subscription base for mobile numbers exceeded that for wireline numbers. Each class has over 1 billion users, with mobile telephony growing by roughly 200 million per year. *See* Jino Kim, *Scare Resources: Spectrum Management & Numbering Issues, ITU Regional Regulatory Seminar* <http://www.itu.int/ITU-D/treg/Events/Seminars/2002/china/pdf/39-doc9-1-jinokim.pdf.> (Aug. 2002).

277. The same has occurred for non-geographically based ("standard industrial classification" or SIC) access codes. Toll free "800" numbers were exhausted several years ago and new access codes were then authorized by the 800 Number Administration Committee, an industry consortium: 866, 877, and 888. Future additions will likely include 855, 844, 833, and 822. The FCC has grappled with the problem of duplicating "vanity" numbers; e.g., would the owner of 1-800-FLOWERS have the right to new SIC numbers in the form of 1-8xx-FLOWERS? *See In the Matter of Toll Free Service Access Codes*, 13 F.C.C.R. 9058 (Mar. 31, 1998) (hereinafter *Toll Free Service Access Codes*).

278. There are 310 geographic area codes currently in use in the United States, 13 non-geographic codes, and 12 geographic codes are pending. *See* NPA, *NPA Information: Area Codes*, <http://www.nanpa.com/area_codes> (accessed Mar. 18, 2003).

number of area codes to double in California, from 13 in 1997 to 25 in 1999. Indeed, when Los Angeles' 213 area code was split to form the 323 area code, the latter was immediately found in "jeopardy" of exhausting its supply of numbers.[279] An "exhaust study" by the North American Numbering Plan Administrator (NANPA) in 1999 estimated that the supply of available telephone numbers will be exhausted as early as 2006 and no later than 2012.[280]

The FCC has responded to these projections.[281] In 1999 it issued a Notice of Proposed Rulemaking (NPRM) to address *the Matter of Number Resource Optimization.*[282] Among the proposed solutions for which it sought comments were: expansion of the number supply (by increasing the number of digits), more efficient allocation of the existing supply (such as number pooling and portability), and implementing a pricing mechanism for number allocation and use. Although the FCC has yet to adopt a market-based allocation system, it appears it will do so shortly and has sought additional comments on

279. "An area code jeopardy situation exists when the forecasted demand for numbering resources exceeds the known supply during the planning and implementation interval for relief in the form of the introduction of a new area code." *In the Matter of Numbering Resource Optimization, Notice of Proposed Rulemaking*, CC Docket 99-200, 14 F.C.C.R. 10322, 10325 n.5 (F.C.C. May 27, 1999) [hereinafter *Numbering Resource Optimization*] (quoting Central Office Code (NXX) Assignment Guidelines) INC 95-0407-008 (rev. Apr. 26, 1999) at § 13.0 (CO Code Guidelines) <https://www.atis.org/atis/docstore/doc_display.asp?ID=1245> (accessed Nov. 16, 2003)) <http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-99-122A1.pdf> (accessed Nov. 16, 2003).

280. *See* North American Numbering Plan Exhaust Study, Lockheed Martin CIS, at 2-1 <http://www.nanpa.com/pdf/NANP_Exhaust_Study.pdf> (Apr. 20, 1999).

281. The FCC maintains a web site on "Numbering Resources." *See* Federal Communications Commission, Numbering Resources <http://www.fcc.gov/wcb/tapd/numbering/> (Feb. 26, 2003).

282. *See Notice of Proposed Rulemaking*, *supra* n. 279. The FCC has issued several "Reports And Orders," as well as "Further Notices Of Proposed Rule Making." The most recent ("Third Order on Reconsideration") was issued on March 13, 2002. *See* FCC 02-73. Another solution the FCC could pursue is full implementation of Recommendation E.164, "The International Public Telecommunication Numbering Plan," developed by the ITU Standardization Sector (ITU-T) in 1997. *See* International Telecommunications Union, *List of ITU-L Recommendation E.164 Assigned Country Codes* <http://www.itu.int/itudoc/itu-t/ob-lists/icc/e164_717.html> (Jun. 23, 2003). The FCC requires its NANP Administrator to be conversant with E.164 (*see* 47 CFR 52.113), but apparently does not require its implementation. The ITU proposal not only vastly increases the number of telephone numbers, by using a 15-digit string (compared to 11 for the NANP), it structures the telecommunications system into international networks and global and national services. Some telcos have already begun replacing switches in anticipation of E.164 implementation. *See* International Numbering Plans, *Homepage* <http://www.numberingplans.com> (accessed Dec. 17, 2003) (describing telephone numbering plans worldwide)

implementation.[283] "The impetus for establishing a market-based numbering resource allocation system was our belief that the lack of efficiency in carrier utilization of numbers may be in part due to the failure of existing allocation rules to recognize the economic value of numbers."[284]

What is the "economic value of [telephone] numbers" and why is that relevant to domain name policy? At first blush, the analogy should be between NANP numbers and IP numbers, not between telephone *numbers* and domain *names*. We agree that exhaustion of the NANP number space, and FCC responses, are highly relevant to IP number policies (an issue beyond the scope of this paper). But telephone numbering policy, especially the "economic value of numbers," also provides a relevant point of comparison for evaluating ICANN's domain name regime.

The economic value of telephone numbers has three dimensions. The first is in having a number at all. The economic and social value of being connected to the PSTN is so well recognized that an elaborate subsidy scheme ("Universal Service") has been created to make telephone service affordable to all Americans.[285] The parallel here is in having an IP address.

The second dimension of value in telephone numbers is in preferred area codes and prefixes. In many communities with split or overlay area codes, certain codes are more desired than others (e.g., 212 in New York, 310 on Los Angeles' Westside). The same is true of some SIC codes, such as 800 (compared to 866 or 877). Thus, long before the NANPA runs out of 10-digit numbers, it will run out of preferred ones.

283. *See* Second Report And Order, *supra* n. 271, at 407 ("we seek comment on whether and how a market-based number allocation system should be implemented. Proper implementation of this system should encourage the efficient use of numbering resources by carriers as well as be competitively neutral, especially towards small businesses. The system's benefits (*i.e.*, more efficient use of numbers) should outweigh carriers' concerns over costs. We believe that alternatives to this system (*i.e.*, allocating numbers for free) would not promote the efficient use of numbers as effectively. Commenters are encouraged to propose ways to implement such a system so as to minimize any unfavorable impact on small entities").

284. *Id.* at 372.

285. *See generally* 47 U.S.C. § 254 (Universal Service); *id.* § 254(b)(3) ("[c]onsumers in all regions of the Nation, including low-income consumers and those in rural, insular and high cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services that are reasonably comparable to the services provided in urban areas at rates that are reasonably comparable to rates charged for similar services in urban areas").

But the greatest value in telephone numbers is found in their linguistic association. In this respect, the telephone *number* space is also its *name* space. At one level, the telephone name space comprises the various telephone directories and databases in use by local telcos around the globe.[286] There are surely economic values in that space, as companies vie for descriptive listings or early placement (e.g., "Saab Independent Repair," "AAA Pest Control"). But with telephone addressing, there is a ready translation between certain names and numbers—so-called "vanity" numbers.[287] Thus, 1-800-356-9377 resolves into 1-800-FLOWERS" and 1-800-937-8529 resolves into 1-800-WESTLAW. Both have considerable value[288] (and the latter is trademarked). In the telephone system, resolution of numbers occurs in two places: in directories and on the telephone keypad. Because of their mnemonic association, telephone numbers have been commoditized and trade on a secondary market.[289] Some exploit that market to extort value from trademark holders and others. The practice of "number brokering" bears striking similarity to cybersquatting.[290]

Market allocation of telephone numbers, as a policy shift at the FCC, is obviously relevant to Internet name space policies.[291] Earlier

286. "A name space is any bounded area in which a given name can be resolved. Name resolution is the process of translating a name into some object or information that the name represents. A telephone book forms a name space in which the names of telephone subscribers can be resolved to telephone numbers." MSDN, *Active Directory Core Concepts: Namespace* <http://msdn.microsoft.com/library/default.asp?url=/library/en-us/netdir/ad/namespace.asp> (accessed Mar. 4, 2003).

287. "[A] vanity number is a telephone number for which the letters associated with the number's digits on a telephone handset spell a name or word of value to the number holder. . .[including] any numbers in which the holders have a particular interest, be it economic, commercial, or otherwise." *In the Matter of Toll Free Service Access Codes, Notice of Proposed Rulemaking*, CC Docket 95-155, 10 F.C.C.R. 13692, 13701-02 (F.C.C. Oct. 5, 1995).

288. *See generally* Diana Lock, *Toll-Free Vanity Telephone Numbers: Structuring a Trademark Registration and Dispute Settlement Regime*, 87 Cal. L. Rev. 371, 373-75 (1999) (stating that "vanity numbers often represent good will investments" and make it easy for customers to contact a company).

289. *See id.* at 375. Domain names have similarly been described as "a mnemonic locator for a numerical address." Interview with David Post, PuntoNet <http://puntonet.netfirms.com/it/enin2511gallegospeterspost.htm> (accessed Feb. 22, 2003).

290. *See* Lock, *supra* n. 288, at 375.

291. There have also been proposals to map telephone numbers to URLs. The Internet Engineering Task Force (IETF) has developed a protocol (E.164 Number Mapping, or "ENUM") that uses DNS-based architecture for telephone number URLs. ENUM is designed to promote convergence between traditional telephone networks and IP networks. Three new gTLDs are proposed for .tel, .fax, and .modem. *See* IETF, *Network Working Group, Request for Comments 2806: URLs for Telephone Calls* <http://www.ietf.org/rfc/rfc2806.txt> (April 2000). ICANN has been following the issue.

we concluded that frequency allocation policies in the broadcast industry also provided a point of comparison. In the next section we take a closer look at the FCC's newly constructed market approaches to frequency, number and name space allocation in broadcast and telephony. These are not ad hoc decisions; rather they are the culmination of decades of experience, litigation, and scholarly study. ICANN would be well advised to undertake a serious review of FCC experience with spectrum allocation and telephone numbering policy as ICANN moves forward to develop in its effort to formulate policy for the DNS.

C. Allocation and Regulation of Name and Number Spaces by the FCC

The broadcast and telephone industries are heavily regulated by the FCC; the former through licensing, the latter through public utility-type regulation.[292] In each instance, the commodities under regulation (frequencies and telephone numbers) are scarce. The FCC's various approaches, historically and currently, to allocating these goods is highly instructive for managing other scarce telecommunications goods such as TLDs and IP addresses.[293] It seems the FCC has tried, at one time or another, every conceivable allocation method. If some of those allocation methods turned out to be inefficient or inequitable, ICANN should be very cautious about employing the same methods for the DNS. In other words, ICANN ought not to "recapitulate the FCC."[294]

See ICANN, *ICANN Meeting in Rio de Janeiro, Brazil* <http://www.icann.org/riodejaneiro> (accessed Dec. 17, 2003) (links to various presentations and tutorials on ENUM given at the Spring 2003 ICANN Meeting, Mar. 25, 2003). So too has the ITU. *See* International Telecommunication Union, *ENUM* <http://www.itu.int/osg/spu/enum> (Feb. 25, 2003).

292. That portion of the telephone industry that is intrastate is also regulated by state public utility commissions. There is substantial overlap with federal regulation. This requires both cooperation (e.g., Federal-State Joint Board on Universal Service, 47 U.S.C. § 410; 47 C.F.R. 0.91) and jurisdictional "separation" (e.g., allocation of intra- and interstate costs, 47 U.S.C. § 225; 47 C.F.R. 36.1). For clarity, this section will focus only on the FCC.

293. *See* Jonathan Weinberg, *ICANN, Internet Stability, and New Top Level Domains*, in *Communications Policy and Information Technology: Promises, Problems, Prospects* (Lorrie Cranor & Shane Greenstein eds., MIT Press 2002) ("And as with the FCC, ICANN's regulatory imperative has flowed largely from scarcity—in this case, the scarcity of generic top level domains in the ICANN root. The scarcity of top level domains is not a technological artifact, though, as with broadcast licensing; rather, ICANN is maintaining it as a policy matter.").

294. *See id.* (quoting e-mail message from Harold Feld, Associate Director, Media Access Project, "ICANN recapitulates the FCC, and does it badly" (Feb. 21, 2001).

In this section we briefly trace the history of licensing and telephone number regulation, exploring along the way the assumptions and policy choices made by regulators. We will then discuss why "quasi-deregulation" has been adopted by the agency and what form it takes. As it turns out, market economics and other social welfare theories have played an important role in the development of FCC allocation policies. They should be examined in formulating gTLD allocation policies as well.

1. The Road to Market Allocation of Spectrum

The Radio Act of 1912[295] was our nation's first effort at spectrum management,[296] declaring it illegal to "use or operate any apparatus for radio communication as a means of commercial intercourse among the several States . . . except under and in accordance with a license, revocable for cause, in that behalf granted by the Secretary of Commerce and Labor." The Act did not specify criteria for licensing nor, apparently, did it authorize the Secretary to promulgate his own.[297] In an early case, the Court of Appeals ruled that Secretary Hoover had no power to deny licenses, but only empowered to assign frequencies.[298] This was followed by a district court decision that a station's use of a frequency not assigned to it was not a violation of the Radio Act.[299] This was reiterated by a 1926 Attorney General opinion.[300] In response, Secretary Hoover abandoned all effort to regulate the spectrum, instead urging that stations "regulate themselves."[301] A "tower of Babel" ensued.[302]

Michael Froomkin has similarly stated, "Instead of engaging in standards work, ICANN is engaged in recapitulating the early procedural errors of federal administrative agencies such as the Federal Communications Commission." A. Michael Froomkin, *Form And Substance In Cyberspace,* 6 J. Small & Emerging Bus. L. 93, 120 (2002).

295. Pub. L. No. 62-264, ch. 287, 37 Stat. 302.

296. Earlier laws were in the nature of technology forcing. *See, e.g.,* The Ship Act of 1910, Pub. L. No. 61-262, ch. 379, 36 Stat. 629.

297. License applications consisted of a postcard request. *See* Mark Goodman, *The Radio Act of 1927 as a Product of Progressivism,* Media Hist. Monographs, 1998-1999 <http://www.scripps.ohiou.edu/mediahistory/mhmjour2-2.htm> (accessed Dec. 17, 2003).

298. *See Hoover v. Intercity Radio Co.*, 286 F. 1003, 1007 (D.C. Cir. 1923) ("The only discretionary act is in selecting a wave length, within the limitations prescribed in the statute, which, in his judgment, will result in the least possible interference.").

299. *See United States v. Zenith Radio Corp.,* 12 F.2d 614 (E.D. Ill. 1926).

300. *See* 35 Ops. Atty. Gen. 126 (1926).

301. *See National Broadcasting Co. v. United States*, 319 U.S. 190, 212 (1943).

302. *See* Goodman, *supra* n. 297 (citing N.Y. Times, Nov. 7, 1926, at sec. xx, 18:1—"the radio signal almost anywhere on the dial sounded like 'the whistle of the peanut stand'").

In the void created by federal incompetence, both the market and the courts responded to restore some semblance of order on the airwaves. Stations did agree amongst themselves on transmission times and frequencies and a healthy market developed in broadcast rights.[303] More importantly, perhaps, a state court decision in 1926 upheld a tort claim by Chicago station WGN against a "wave jumper" that was broadcasting so close to WGN's frequency as to cause interference. The decision was the first to recognize "a particular right or easement in and to the use of [a] wave length."[304]

Just as a common law of broadcast property rights (based on first occupation) began to develop, Congress passed the Radio Act of 1927 and created the Federal Radio Commission (FRC).[305] Salient provisions of the Act confirmed public ownership of the airwaves and specified merit-based free licenses, in exchange for which broadcasters would provide public service. Congress rejected alternative allocation schemes such as first occupation, lottery and auction. Rather, applicants would be evaluated on the basis of "public interest, convenience and necessity."[306] In cases of competing applications, administrators would hold comparative hearings. The notion of government control through licensing flowed from the antecedent principle of public ownership of the spectrum, "an idée fixe in the debates of Congress."[307]

One of the FRC's first decisions was to keep the broadcast band at its current size rather than to expand it to accommodate all existing broadcasters. Scarcity was codified. Licensing criteria and broadcasting standards quickly followed. The former favored wealthy applicants with superior technical capability and broadcast experience. The latter favored middle-of-the road programming. Broadcasts by socialist stations,[308] unconventional columnists,[309] social

303. Hazlett, *supra* n. 225, at 143-47.

304. *Tribune Co. v. Oak Leaves Broad. Station*, Circuit Court, Cook County, Ill (1926) (unpublished, reprinted in part in Hazlett, *supra* n. 225, at 149-51).

305. Radio Act of 1927, Pub. L. No. 69-632, ch. 169, 44 Stat. 1162 (1927).

306. This was the standard then in use for other public utilities. *See* Stuart M. Benjamin et al., *Telecommunications Law and Policy* 17 (Carolina Ac. Press, 2001).

307. *Id.* (quoting Note, *Federal Control of Radio Broadcasting*, 39 Yale L.J. 244, 250 (1929)).

308. *See* FRC, Second Annual Report 156 (1928) (decision of Aug. 22, 1928 involving radio station WEVD).

309. *See* Benjamin et al., *supra* n. 306, at 22 (citing *KFKB Broad. v. FRC*, 47 F.2d 670 (D.C. Cir. 1931)).

critics,[310] evolutionists,[311] and fringe candidates[312] were forced off the air. As the Commission stated, there was "not room in the broadcast band for every school of thought, religious, political, social and economic, each to have its separate . . . mouth piece in the ether."[313] Despite the prohibition of censorship in the 1927 Act,[314] both the FRC and the Court of Appeals effectively adopted policies and interpretations of the statute that had the effect of nullifying this prohibition. This regime was the product of a statutory mandate to promote "the public interest."[315] The underlying justification for the rationing of licenses was spectrum scarcity, but spectrum-scarcity was itself the product of the regulatory regime. Just as the advent of the printing press a half-millennium before prompted the Licensing Act,[316] discovery of radio waves as a means of communication lead to licensing of spectrum use. In both cases, what was really being licensed was the right to speak.[317]

In 1934, the Radio Act was supplanted by the Communications Act[318] and the FRC was replaced by the FCC. This transition was accompanied by minimal changes in broadcast licensing policies and standards. In fact, the ownership and licensing precepts established in 1927 remained mostly intact for seventy years. Those precepts were:

310. *See id.* at 21 (citing *Trinity Methodist Church v. FRC*, 62 F.2d 850 (D.C. Cir. 1932)).

311. *See* Goodman, *supra* n. 297.

312. *See id.*

313. Benjamin et al., *supra* n. 306, at 20 (citing FRC, Third Annual Report at 32). As The Literary Digest recommended, licenses should be issued only to "high types" providing "well-rounded" programming. *See* Goodman, *supra* n. 297 (citing "To Kill Off Broadcasting 'Pirates,'" The Literary Digest, 13-14 (May 7, 1927)).

314. "Nothing in this Act shall be understood or construed to give the licensing authority the power of censorship over the radio communications or signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the licensing authority which shall interfere with the right of free speech by means of radio communications. No person within the jurisdiction of the United States shall utter any obscene, indecent, or profane language by means of radio communications." Radio Act of 1927, Section 29. *See also id.*, Section 18 (no censorship of candidate broadcasts).

315. For a thorough discussion of forces influencing the 1927 Act, *see* Goodman, *supra* n. 297.

316. 14 Car. 2, ch. 33, § 5, reprinted in 5 Statutes Of The Realm 428, 430 (1814). The Licensing Act was preceded by several other censorship laws, such as the Star Chamber Decree of 1586. *See* L. Ray Patterson and Craig Joyce, *Monopolizing The Law: The Scope Of Copyright Protection For Law Reports And Statutory Compilations,* 36 UCLA L. Rev. 719, 785 (1989).

317. *See generally* Ithiel de Sola Pool, *Technologies of Freedom* (reprint ed. 1984); Stuart Minor Benjamin, *The Logic of Scarcity: Idle Spectrum as a First Amendment Violation*, 52 Duke L.J. 1, 38-41 (2002).

318. Pub. L. No. 73-416, ch. 652, 48 Stat. 1064.

a) public ownership of the airwaves, b) short term licensing, c) free rent *to* broadcasters, and d) monopoly rents *by* broadcasters. In other words, a select few—the entrenched stakeholders—were given rights worth billions of dollars.[319] The value of broadcast licenses typically derived from two sources: advertising revenue (income) and sale of licenses (the capitalized value of the expected future income stream).[320] Prior to the grandfathering of digital licenses to television broadcasters in 1996, the estimated opportunity cost to taxpayers of free licensing was as high as $100 billion or more.[321] The granting of free digital licenses to existing television broadcast license holders has resulted in an additional wealth transfer to entrenched stake holders of $70 billion or more.[322]

In addition, the broadcast licensing regime imposes direct costs on government. The FCC's budget is approximately one-quarter-billion dollars annually.[323] This cost is high because ad hoc license evaluation and even systematic spectrum decision making both require substantial expertise and staff resources. Moreover, given the economic rents that can be realized by those who are awarded licenses, it is not surprising that there is substantial competition. In the case of broadcast licenses, that means holding expensive "comparative hearings" (dubbed "beauty contests") and hearings on "petitions to deny" license renewal.[324] It might all be worth it if licensees were truly fulfilling their public trust responsibilities and promoting the "public interest, convenience and necessity." But the

319. "The great irony in Congress's declaration that the electromagnetic spectrum is the possession of the people is that access to the spectrum is almost completely closed to the public. The spectrum is locked away in blocks of bandwidth licensed to a privileged few through methods that are too complex and expensive for all but major corporations or the politically connected to bear (an extraordinary number of broadcast licenses are held by former members of Congress)." Arthur De Vany, *Implementing a Market-Based Spectrum Policy*, 41 J.L. & ECON. 627, 641 (1998).

320. Technically, licenses cannot be sold; instead they are "transferred" along with the sale of broadcast station. *See* 47 U.S.C. § 310 (d) (2003).

321. *See* Letter from Robert M. Pepper, Chief, Office of Plans and Policy (FCC), to Sen. Lieberman (May 5, 1995) (estimating value of the analog channels to be returned at the end of the transition to DTV from 20 to 132 billion dollars). *See also* Hazlett, *supra* n. 225, at 136 (estimating value of spectrum licenses at over $1 billion per year).

322. *See id.* (digital TV spectrum worth between 11 and 70 billion dollars); Editorial, *The Great Digital Giveaway*, Multinational Monitor (May 1997).

323. While license applicants and holders pay user fees to the FCC, they do not cover the agency's administrative costs. *See* Memorandum, Congressional Budget Office, *Two Approaches For Increasing Spectrum Fees* <ftp://ftp.cbo.gov/10xx/doc1047/specfees.pdf> (Nov. 1998).

324. *See* 47 U.S.C. § 309.

failure of the broadcast industry on this score is so well known that further argument on this point is unnecessary.

Suffice to say that it was official government policy for most of the twentieth century to give away public property and convert public goods into private ones. Early stakeholders were the beneficiaries. Radio stations sell in the hundred million dollar range,[325] and television stations are priced in the multi-hundred million dollar range.[326] Networks cost more—roughly $20 billion.[327] Should not the federal treasury be getting some of this windfall?

Most economists think so, and have repeatedly told the FCC. One of the earliest critics of spectrum allocation policy was Ronald Coase, the noted British economist (later at the University of Chicago).[328] In testimony before the FCC in 1959, Coase argued for a system of competitive bidding (auctions) for licenses.

> [U]se of the pricing mechanisms . . . would avoid the need for much of the costly and time-consuming procedures involved in the assignment of frequencies by the Commission. It would rule out inefficient use of frequencies by bringing any proposal for the use of such frequencies up against the test of the market, with its precise monetary measures of cost and benefit. . . And it would avoid that arbitrary enrichment of private operators of radio and television stations which inevitably follows from the present system. We sometimes hear denunciations of giveaways and

325. *See* Inside Radio, News & Analysis <http://media.radcity.net/ZMST/StalkingtheMostValuableFM.pdf> (accessed Mar. 5, 2003).

326. *See* J.W. Smith, *Economic Democracy: The Political Struggle for the 21st Century* (2nd ed. 2002) ("In major markets, a typical station and license worth $10 million in 1959 was worth $400 to $500 million by 1987.") (quoting Bernard D. Nossiter, *The F.C.C.'s Big Giveaway Show*, The Nation (Oct. 26, 1985). San Francisco station KRON sold in 1998 for what may be the highest amount ever paid for a TV station—$823 million. *See* Jeff Kearns, *The Story At 11*, Metro, Silicon Valley's Weekly Newspaper, <http://www.metroactive.com/papers/metro/12.06.01/cover/kntv-0149.html> (Dec. 6-12, 2001).

327. In 1995 Walt Disney Co. acquired Capital Cities/ABC for $19 billion, at the time the second-highest price ever paid for a U.S. company. *See* Nick Louth (Reuters), *MCI says it's in talks for merger/British Telecom eyes giant buyout*, Houston Chronicle (Business) 1 (Nov. 2, 1996), available at 1996 WL 11573868 (comparing MCI / BT merger to the other largest to-date mergers involving U.S. companies); Steve McClellan, *Megamedia's Megadeal, Broadcasting & Cable* 14 (Aug. 7, 1995); Jay Sherman, *News, Sports, Entertainment ... and Innovation*, Television Week 26 (May 19, 2003).

328. Auctioning had been advocated as early as congressional negotiations on the 1927 Act. *See* Hazlett, *supra* n. 225, at 143-47; *id.* at 137 (citing Leo Herzel, *"Public Interest" and the Market in Color Television Regulation*, 18 U. Chi. L. Rev. 802-16 (1951)).

> their corrupting influence. You, gentlemen, are administering what must be one of the biggest giveaways of all.[329]

Coase refined his reasoning in his now famous theory ("Coase theorem") that, in the absence of transaction costs, efficiency of resource allocation is independent of how a property right is initially assigned. As applied to broadcast, it holds that initial license allocation would have little effect on who gets to use the spectrum. Licensees and aspirants would "agree themselves around" the FCC's initial distribution of rights and effectuate a license transfer whenever it was to their mutual advantage.[330] In most cases, the market would achieve Coasian optimality by reposing broadcast rights with whoever was willing to pay most for them.[331] For this and other writings on the institutional structure of the economy Coase won the Nobel Prize in economics in 1991.[332]

In short (assuming the constraint of forced scarcity), federal licensing policy had little influence on the actual use of the airwaves, only on who received windfalls.[333] As Thomas Hazlett describes it, federal policy went through two epochs corresponding to different theories of spectrum regulation. These were the "chaos theory" (self-regulation by the industry prior to 1927), and the "error theory"

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329. Ronald Coase, *Why Not Use the Pricing System in the Broadcast Industry?* Testimony before the FCC, December, 1959 (reprinted in *4 Study of Radio & T.V. Broadcasting*, No. 12782 (1959)); *see* 3 Ronald Coase, The Federal Communications Commission, 2 J.L. & Econ. 1, 17-35 (1959).

330. *See id.*

331. *But see* Evan Kwerel, *Auctioning Spectrum Rights*, Paper to the Federal Communications Commission (Feb. 20, 2001) (secondary market in licenses is "still inferior to auctions. Sequential, after-market negotiations may not assign licenses to the parties that value them the most highly, or may take years to do so because of high transaction costs and strategic bargaining. For example, a license winner may act as a holdout when another party seeks to acquire the license in the after-market. This 'holdout problem' may be particularly severe when a party is attempting to acquire multiple licenses held by numerous other entities."). Evan Kwerel & Walt Strack, *Auctioning Spectrum Rights* <http://wireless.fcc.gov/auctions/data/papersAndStudies/aucspec.pdf> (Feb. 20, 2001).

332. *See* Press Release, *The Royal Swedish Academy of Sciences, The Sveriges Riksbank (Bank of Sweden) Prize in Economic Sciences in Memory of Alfred Nobel for 1991* <http://www.nobel.se/economics/laureates/1991/press.html> (Oct. 15, 1991).

333. *See* Pool, *supra* n. 317, at 139-40 ("Under existing practice the original licensees make a windfall profit by selling the license to someone else.... If the market... had been pushed one level further back and the government had offered spectrum rights for lease or sale at a price reflecting market value, any windfall would have gone to the public, not to politically favored individuals.").

(licensing per "public interest" standard after 1927).[334] Neither produced desirable effects.

A third era in licensing—lottery—began with experimental trials in the 1980s. After being inundated with thousands of applications for new cellular and Personal Communications Service (PCS) licenses, each requiring comparative hearing, the FCC lobbied Congress for lottery authority. It came in the Omnibus Budget Reconciliation Act of 1981.[335] Lotteries were quickly extended to new classes of broadcast service—Low-Power Television (LPTV) and Low-Power FM radio (LPFM), in part.[336] The hope was that random selection would speed up licensing and deployment of these new services. That hope faded quickly.

Although cheaper to administer, lotteries proved to be an inefficient means of awarding licenses. Lottery applications were easy to submit. Applicants did not need to provide detailed credentials, as they would in the case of comparative hearings. Nor would they need to conduct market studies and ascertain the need or value of service, as they would if they had to amortize the cost of a license obtained at market price. So applications came in by the hundreds of thousands.[337] Winners would often "flip" or resell their licenses to larger entities at substantial profit "without ever delivering service to a single customer."[338] Some licenses won at lottery were resold in short order for tens of millions of dollars.[339] The windfalls continued, as per the Coase Theorem. But the transaction costs were high, including the cost of delay in getting licenses to firms that could actually use them. "One estimation of social cost for the ten-year delay in licensing of

334. *See* Hazlett, *supra* n. 225, at 138-43.

335. Lotteries were authorized by the Omnibus Budget Reconciliation Act of 1981, Pub. L. No. 97-35, 95 Stat. 357, 736-37 (codified as amended at 47 U.S.C. § 309(i) (2001)).

336. *See In the Matter of Creation of a Low Power Radio Service, Notice of Proposed Rulemaking*, MM Docket 99-25, ¶ 103 <http://www.fcc.gov/Bureaus/Mass_Media/Notices/1999/fcc99006.txt> (Feb. 3, 1999).

337. *See* Peter Cramton, *Spectrum Auctions, Handbook of Telecommunications Economics*, 4 (Feb. 2001) (reporting that the FCC received over 400,000 applications for cellular licenses).

338. Antoinette C. Bush & Marc S. Martin, *The FCC's Minority Ownership Policies From Broadcasting to PCS*, 48 Fed. Comm. L. J. 423, 426 (1996).

339. *See* Brian M. Rowland, *Minority Preferences In Federal Communications Commission Licensing Practices and Procedures* <http://www.brianrowland.com/articles/Minority_Preferences_FCC_Lisencing.htm> (accessed Feb. 23, 2000) (*citing* In the Matter of Implementation of Section 309(j) of the Communications Act Competitive Bidding, Notice of Rulemaking, PP Docket 93-253, 8 F.C.C.R. 7635, 7641 (1993) ("lottery winners of the rural licenses for Columbia County, Wisconsin, sold for $62.3 million in 1990, 165 days after [being awarded]").

cellular providers [by lottery] was 2 percent of Gross National Product (GNP)."[340] By 1985, the FCC indicated its desire to eliminate the lottery system.

"The long policy march to FCC license auctions"[341] reached its destination during the Clinton administration. The Omnibus Budget Reconciliation Act of 1993[342] authorized the FCC to use competitive bidding to assign radio licenses in non-broadcast bands (e.g., wireless telephony).[343] A vigorous and successful auction regime took hold.[344] A 1997 report by the Congressional Budget Office ("CBO") found that "by most assessments, the FCC auctions have assigned licenses to use the spectrum in an economically efficient way."[345] CBO also estimated that spectrum auctions would "yield $27.0 billion in receipts to the federal Treasury" in the first five years of license sales.[346] Beyond 1998, however, auction revenue would tail off substantially, producing only an estimated $6.0 billion in the following five years.[347] However, if the FCC's auction authority were expanded, for instance to include broadcast frequencies, projected revenues would jump to more than $30 billion. These funds would surely help narrow the budget deficit.[348]

340. Brian C. Fritts, *Private Property, Economic Efficiency, and Spectrum Policy in the Wake of the C Block Auction*, 51 Fed. Com. L.J. 850, 854 (1999).

341. Thomas W. Hazlett, *Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?*, 41 J. L. & Econ. 529, 530 (1998).

342. Pub. L. No. 103-66, 107 Stat. 312, August 6, 1993.

343. The Act listed several objectives to be attained through auctions, including: rapid deployment of new technologies; avoiding excessive concentration of licenses by disseminating them among a wide variety of applicants; and efficient use of the spectrum. *See* 47 U.S.C. § 309(j).

344. The first spectrum auction, conducted in July 1994, was for the "C Block" in the PCS band. It netted $650,306,674 in revenue. *See* Federal Communications Commission, *Auction 1: Nationwide Narrowband (PCS)* <http://wireless.fcc.gov/auctions/01> (July 25, 2003).

345. Congressional Budget Office, *Where Do We Go From Here? The FCC Auctions And The Future Of Radio Spectrum Management* at 17 <ftp://ftp.cbo.gov/0xx/doc9/fccauct.pdf> (April 1997); *see also* Eli Noam, *Spectrum Auctions: Yesterday's Heresy, Today's Orthodoxy, Tomorrow's Anachronism. Taking the Next Step to Open Spectrum Access*, 41 J.L. & Econ. 765 (1998) ("The auction paradigm for spectrum allocation has moved from heresy to orthodoxy,").

346. Congressional Budget Office, *supra* n. 345, at Preface.

347. *See id.* at 29.

348. Since that report the spectrum market has become exceptionally volatile, not just in the US but worldwide, and some auction winners have defaulted. Accordingly, the CBO has revised its estimates on several occasions. *See, e.g.*, Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2001-2010*, at 92, 117-20 <ftp://ftp.cbo.gov /18xx/doc1820/e&b0100.pdf> (accessed Dec. 17, 2003).

Later that year, Congress passed the Balanced Budget Act of 1997.[349] It expanded the FCC's auction mandate to include new broadcast licenses.[350] To be sure, very few "new" broadcast licenses are issued these days (the consequence of spectrum scarcity), and will not be until analog licenses are reclaimed as part of the transition to digital television.[351] But auctions are now underway for broadcast as well as most other commercial uses of the spectrum.[352] Competitive bidding is the fourth and latest era of license allocation policy.[353] By all accounts, the FCC's experience with auctions has validated economic theory favoring auctions as the allocation method yielding the highest and best use of the spectrum.[354]

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349. Pub. L. No. 105-33, 111 Stat. 251.

350. *See id.* § 3002 ("[i]f . . . mutually exclusive applications are accepted for any initial license or construction permit, then, except as provided in paragraph (2), the Commission shall grant the license or permit to a qualified applicant through a system of competitive bidding that meets the requirements of this subsection.").

351. Full-power television broadcasters were each entitled to a second license, to be used for digital broadcasts, during the decade-long transition from analog to digital television. When the transition is complete, sometime after 2006, broadcasters must return their analog licenses. However, analog channels will be auctioned off for future use even before they are reclaimed by the FCC. *See id.* § 3003.

352. Four license categories are exempt from competitive bidding: public safety; digital television for incumbent licensees; non-commercial educational and public broadcast; and international satellite. *See* 47 U.S.C. § 309(k) (renewal of broadcast licenses); 47 U.S.C. § 765f (orbital satellite slots and spectrum). *See generally* Federal Communications Commission, *About Auctions: Introduction* <http://wireless.fcc.gov/auctions/about/index.html> (Sept. 12, 2001). In addition, large swaths of the spectrum are reserved for governmental use (mostly military). Proposals are underway to open some of this valuable spectrum to auction, not just to generate revenue, but to also promote conservation and innovation.

353. The FCC maintains an auction website which contains public notices, procedures, schedules of pending auctions, and results of completed ones. *See id.*

354. The experience in Europe has been somewhat different. Recent auctions for new "third generation" (3G) wireless telephone frequency licenses have had mixed results, sometimes leading to company failure and excessive pricing. Much of this is due, we believe, to three factors: (1) inconsistent allocation methods among countries in the European Union (EU), making it difficult for national companies to compete in other markets; (2) poor auction design; and (3) lack of experience in an incipient industry (3G), resulting in inaccurate market models and overbidding by auction participants. *See* Owen M. Kendler, *Auction Theory Can Complement Competition Law: Preventing Collusion In Europe's 3g Spectrum Allocation*, 23 U. Pa. J. Int'l Econ. L. 153 (2002) (discussing flaws in EU 3G auctions).

We do not believe these problems have plagued spectrum auctions in the U.S. or are likely to arise with domain name auctions. *See* Cramton, *supra* n. 337, at 2 ("In comparison with other countries, the FCC auctions represent the state-of-the-art in spectrum auction design and implementation. . .The FCC's leadership in spectrum auctions has had positive consequences worldwide. Many countries wisely have imitated the FCC auctions; those that have not have suffered from inefficient license assignments and other flaws").

One aspect of spectrum management that deserves mention is the "service rules" that determine permissible uses for each frequency. Before the FCC can assign licenses it must first devise a "band plan," which involves allocating a set of frequencies for a particular radio service. Thus, the region between 535 and 1705 KHz is designated as the AM band, the region between 88.0 and 108.0 MHz is designated as the FM band, and so on. Within each band only the specified use is allowed.[355] Band plans are based on technical needs (matching frequencies to compatible uses) and predicted demand for bandwidth.[356]

For example, until recently, usage of the 470-806 MHz band was limited to UHF-TV. Therein lies a problem. The UHF band is 336 MHz wide and can accommodate 28 stations in every TV market (four times as many as the VHF band). That may have been appropriate when the FCC established the band in the 1960s, anticipating rapid growth in broadcast TV. But an emerging technology—cable—interrupted that plan, and UHF has languished. Changing the band use means evicting incumbent UHF stations and paying them to relocate.[357] Central planning of frequency use can be very inefficient.[358]

Nonetheless, we acknowledge that spectrum auctions in Europe have left a bitter taste for some, not the least of whom is the European Parliament. Clause 11 of its "Resolution on the Commission Communication" regarding the 1999 EU Regulatory Framework for Electronic Communications states the Parliament "is concerned to note that the Commission does not discourage spectrum auctions, since auctions tend to raise license fees above their economic value, raise consumer tariffs and hamper the introduction of new services") (quoted in Michael Libertus, *The EU Regulatory Framework for Electronic Communications and the Commissions Proposal for a Decision on a Regulatory Framework for Radio Spectrum Policy in the Community: Concerns of and Consequences for Public Broadcasters in the EU*, 6 Int'l J. Comm. L. & Pol'y 1, 7 (Winter 2000/2001)).

355. For a complete chart of all bands, *see* U.S. Dep't of Commerce, *U.S. Frequency Allocations: The Radio Spectrum* <http://www.ntia.doc.gov/osmhome/allochrt.pdf> (Mar. 1996).

356. Under the Slepian-Wolf theorem of information transfer frequency partitioning is optimal only when the bandwidth of each band is proportional to its power at each receiver. *See* D. Slepian & J.K. Wolf, *Noiseless Coding of Correlated Information Sources, IEEE Transactions on Information Theory*, (July 1973); *See* Thomas M. Cover, Comments on Broadcast Channels <http://yreka.stanford.edu/~cover/papers/cover_98.pdf> (Oct. 1998).

357. The lower 700 MHz band (UHF channels 52-59) and upper 700 MHz band (channels 60-69) are being converted from television to 3G wireless use. But the process is so cumbersome that auctions for these frequencies have been postponed several times. "This reallocation process necessarily consumes substantial public and private resources, reduces certainty for users of spectrum, discourages investment, and delays the introduction of new services. This process also discourages innovation because it requires entrepreneurs to disclose their ideas to the public well in advance of their introduction, severely diminishing the competitive advantage from being first to market." Gregory L.

Shortly after its embrace of market allocation of licenses, the FCC began to explore changes in spectrum policy that would let the market also decide the highest and best use of bands. In 1999, the Commission issued a major policy statement in a "Spectrum Plan for the New Millennium."[359] The new policies included spectrum flexibility—"relaxed service rules, which would allow licensees greater freedom in determining the specific services to be offered."[360] No longer would each frequency be tied to a pre-determined use, often confining it to outmoded technologies. If a PCS provider valued a vacant channel in the 700 MHz band more than a broadcaster, and interference problems were worked out, why should that channel be limited to broadcast use? Band flexibility promotes technological and allocative efficiency.[361] Under this approach, the market would not only determine license assignment (who gets what frequency), but also what service would provide the highest and best use of the frequency.[362]

Perhaps auctions are too good to be true. They return billions of dollars to the US treasury, they increase allocative efficiency, promote innovation and new technologies, reduce bureaucratic overhead and political patronage. Surely, they must undermine some important goals of our nation's telecommunications policy, such as serving the public interest.[363] Indeed, if the *quid pro quo* for free

Rosston & Jeffrey S. Steinberg, *Using Market-Based Spectrum Policy To Promote The Public Interest*, 50 Fed. Comm. L.J. 87, 92-93 (1997).

358. Because of fragmentation of the spectrum, the FCC has been asked to hold "band restructuring auctions" which would allow aggregation of bands for emerging uses. *See* Evan Kwerel & John Williams, *FCC Office of Plans and Policy, A Proposal for a Rapid Transition to Market Allocation of Spectrum* (OPP Working Paper Series #38, at 23) (Nov. 2002).

359. *In the Matter of Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, Policy Statement* 14 F.C.C.R. 19868, F.C.C. 99-354 (1999).

360. *Id.* at 19870. Other changes in spectrum policy included promoting the use of new technologies, streamlined assignment, fostering an active secondary market in licenses, and making more spectrum available for current and emerging services.

361. *See* Rosston & Steinberg, *supra* n. 357, at 99.

362. "Dynamic bands" also respond to technological change in a way that "static bands" cannot. Thus, for instance, deployment of the next generation of "smart" radios (e.g., software defined and cognitive radios), requires flexibility in frequency allocation.

363. Apparently, this is the view in Europe. A 2000/2001 review on "The EU Regulatory Framework for Electronic Communications" noted that public interest considerations play a vital role in frequency assignment. Libertus, *The EU Regulatory Framework*, *supra* n. 354, at 4 ("frequency auctions, or the introduction of a secondary market, cannot be transferred to the broadcasting sector [because] it does not account for the fact that, especially in broadcasting, public interest objectives such as pluralism, cultural diversity and access to services orientated on public welfare must be considered").

broadcast licenses was public interest programming, then licenses bought at market price must not be so constrained. Except that is not the case. One doesn't have to denigrate the quality of public interest programming over the past 75 years to appreciate that many industries are imbued with public interest obligations. Moreover, to the extent license requirements such as children's and public affairs programming lessen profitability, that fact would simply be reflected in the prices paid at auction.[364]

A more serious objection to auctioning off the spectrum is that it creates a property rights regime, turning the public airwaves into private property. Once licenses and the spectrum rights they represent are deemed property, the argument goes, government loses control over such things as ownership, transferability, use and content. Indeed, many of the early advocates of spectrum auctions, such as Herzel and Coase, also favored property rights in frequencies. Here the consequences are significant. If broadcasters owned their pieces of spectrum, content requirements such as "equal time" and the "fairness doctrine" might constitute forced speech, thus violating the First Amendment.[365] Private property also connotes free alienability, quiet enjoyment, the right to use for productive purposes, and the right to exclude others. Each of these "sticks" in the "bundle of rights" that constitute property is currently regulated by the FCC, although increasingly less so in an era of deregulation. Perhaps the most controversial of these sticks is exclusivity. In an era of advanced technologies (such as "ultra-wideband," "agile" and "software-defined radio"), which can share the spectrum without causing interference, a property rights approach might preclude compatible uses or foster rent-seeking by owners, neither of which leads to efficient use of the spectrum.[366]

The debate over property rights in the spectrum is an exciting one for economists and legal philosophers, but resolution of these issues is not required for a pragmatic assessment of market allocation

364. For a more thorough discussion of this point and other consequences of auctions, *see* Kwerel, *supra* n. 331, at 3-6.

365. *Compare Red Lion Broad. Co. v. F.C.C.*, 395 U.S. 367, 390 (1969) (broadcasters' First Amendment rights not compromised by content regulation when operating in scarce public spectrum) *with P. Gas & Elec. Co. v. Pub. Utilities Commn*, 475 U.S. 1 (1986) (government may not usurp utility company's private property to carry message with which it disagreed).

366. *See* Yochai Benkler, *Some Economics Of Wireless Communications*, 16 Harv. J.L. & Tech., 25, 32-33 & 48 (2002). *See also* FCC Spectrum Policy Task Force, *Report of the Spectrum Rights and Responsibilities Working Group* <http://www.fcc.gov/sptf/files/SRRWGFinalReport.pdf> (Nov. 15, 2002).

of the spectrum. First, legal rights associated with property ownership do not derive from natural law; they are defined by the state and can take whatever form Congress decides to give them.[367] Purchasers at auction currently take their licenses with a well-defined statutory preclusion of ownership rights.[368] Thus, licenses purchased from the FCC contain a whole host of restrictions that are inimical to a pure property rights regime.[369]

Second, in terms of content regulation, the Supreme Court has moved away from any sharp distinction between public and private property. Thus, in *FCC v. Pacifica Foundation*,[370] the Court upheld a prohibition on indecent broadcasts without once mentioning the *Red Lion* justification of scarcity or public spectrum. Nor did the Court give any greater scrutiny to cable must-carry rules in *Turner Broadcasting v. FCC*,[371] because the cable system was privately owned. To the extent a public-private distinction is still important in telecommunications, it is based on who has access to the speech, rather than who owns the channel of communication.[372] In sum, we believe the public interest can be promoted, and reasonable regulation of licensees will be upheld (and unreasonable ones struck down), whether or not licenses are bought at auction or are obtained at zero cost.[373]

The final objection to spectrum auctions is that only wealthy applicants can afford to buy licenses; poor, small-business and minority applicants are shut out. This is a serious concern, especially given our nation's commitment to "diversity" on the airwaves.[374] Of

367. *See U. S. v. Gen. Motors Corp.*, 323 U.S. 373 (1945); *Lucas v. So. Car. Coastal Council*, 505 U.S. 1003 (1992) (scope of property rights is determined by "background principles" in state law).

368. *See* 47 U.S.C. § 301 (2001).

369. It is for this reason, perhaps, that the debate over property rights in spectrum is so vibrant. *See, e.g.*, Stanford Law School Center for Internet and Society, March 1, 2003 *Conference on Spectrum Policy, Property or Commons?* <http://cyberlaw.stanford.edu /spectrum> (accessed Oct. 4, 2003).

370. 438 U.S. 726 (1978).

371. 512 U.S. 622 (1994) (content-neutral must-carry requirements for cable did not violate cable company's first amendment rights).

372. *See, e.g., Ashcroft v. ACLU*, 535 U.S. 564 (2002) (Child Online Protection Act violated first amendment rights of Internet users); *Sable Communications of Cal., Inc. v. F.C.C.*, 492 U.S. 115, 127 (1989) ("The private commercial telephone communications at issue here are substantially different from the public radio broadcast at issue in *Pacifica*.").

373. It has never been suggested that regulations validly applied to free licenses are somehow suspect when applied to broadcasters who obtain their licenses in the secondary market at substantial cost.

374. *See, e.g.*, 47 U.S.C. § 257 (2003) ("In carrying out subsection (a) [identifying and eliminating . . . market entry barriers for entrepreneurs and other small businesses], the

course, the "beauty contest" method of spectrum assignment was hardly a model of allocational equity, given that most broadcast licenses are held by some of the largest corporations and conglomerates in America.[375] Indeed, the FCC's licensing scheme created substantial barriers to entry by women and minority broadcasters, leading to a homogenized industry.[376] The agency eventually tried to overcome this with various affirmative action measures.[377] When most of those efforts were declared unconstitutional,[378] the corporate dominated demographic seemed as entrenched as ever.[379]

It may seem counter-intuitive, but many hailed the advent of auctions as a way to level the playing field and diversify license ownership. Former FCC Chairman Reed Hunt claimed that one of the first spectrum auctions (for PCS) was "the greatest single opportunity ever made fairly available to small businesses, women and minorities. For the first time in our nation's history, the federal government is creating opportunities in a new industry in which all Americans will have a fair chance to compete from day one."[380] While seemingly Pollyannaish, there are several reasons why Hundt was at

Commission shall seek to promote the policies and purposes of this chapter favoring diversity of media voices, vigorous economic competition, technological advancement, and promotion of the public interest, convenience, and necessity"); 47 U.S.C. § 396 ("it furthers the general welfare to encourage public telecommunications services which will be responsive to the interests of people both in particular localities and throughout the United States, which will constitute an expression of diversity and excellence"); and 47 U.S.C. § 548 (development of competition and diversity in video programming distribution).

375. Lawrence J. White, *"Propertyzing" The Electromagnetic Spectrum: Why It's Important, And How To Begin*, at 26 <http://www.stern.nyu.edu/eco/wkpapers/workingpapers00/00-08White.pdf> (Oct. 20, 2000) (stating that "the FCC stewardship and licensing system has in fact meant severe limitations on general access to spectrum use, and the limitations have favored rich individuals and sizable companies").

376. *See Metro Broad., Inc. v. FCC*, 497 U.S. 547, 553 (1990) ("In 1971, minorities owned only 10 of the approximately 7,500 radio stations in the country and none of the more than 1,000 television stations"). *See also supra*, pt. III(C)(1) (The Road to Market Allocation of Spectrum).

377. *See, e.g., Metro Broad., Inc. v. FCC*, 497 U.S. 547 (1990) (upholding minority preference policies in license grants).

378. *Metro Broadcasting* was overruled by *Adarand Constructors v. Pena*, 515 U.S. 200 (1995). *See also Lutheran Church-Mo. Synod v. FCC*, 141 F.3d 344, 356 (D.C. Cir. 1998) (invalidating FCC equal employment opportunity program designed for women and minorities).

379. Citizens' Commn on Civil Rights, Seven Biennial Report & Mark Lloyd, *The Progress and Proposals for a Civil Rights Agenda in the Communications Policy Arena*, 293, 299-300 (2002).

380. *See* FCC Report No.DC-2621, *Commission Adopts Competitive Bidding Procedures For Broadband PCS* (PP Docket Action No. 93-253) (June 29, 1994).

least partially right. First, as new spectrum was opened up and made available on neutral grounds, entities not embedded with the agency realized opportunities foreclosed to them under the prior regime. Second, expansion of the spectrum helped disaggregate the enormous concentration of media and license ownership that prevailed under the old system. Concentration is the largest threat to diversity.[381] Recall that in theory according to the Coase theorem, and as observed in practice, ownership of a private good (such as a radio license) ultimately rests with the party most highly valuing it, irrespective of allocation method. That's how the rich and powerful wound up controlling the spectrum in the first place. Auctions hardly created or exacerbated that problem.

Finally, the FCC could accomplish through auctions that which had been denied to it by the use of regulatory preferences. Through the use of bidding credits, the agency was able to foster license acquisition by small businesses, thereby indirectly promoting viewpoint, ethnic and gender diversity, as well as spurring competition.[382] Indeed, Congress mandated that it do so: in designing auctions, "the Commission shall include safeguards to protect the public interest in the use of the spectrum and shall seek to promote [specified] purposes."[383] Among those purposes were:

> "promoting economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women."[384]

381. *See* Mark N. Cooper, *Equality In The Information Age: Inequality In The Digital Society: Why The Digital Divide Deserves All The Attention It Gets*, 20 Cardozo Arts & Ent. L.J. 73, 113-14 (2002). *See also Red Lion*, 395 U.S. at 401("Congress does not abridge freedom of speech or press by legislation directly or indirectly multiplying the voices and views presented to the public through time sharing, fairness doctrines, or other devices which limit or dissipate the power of those who sit astride the channels of communication with the general public.").

382. *See, e.g.*, Fifth Report and Order, In the Matter of Implementation of Section 309(j) of the Communications Act—Competitive Bidding, 9 F.C.C.R. 5532 (June 29, 1994); 47 C.F.R. § 24.709(a)(1) (1998) (bidding credit for small business).

383. 47 U.S.C. § 309(j)(3) (2003).

384. *Id.* Auction preferences for women and minorities were abandoned after *Adarand*. But the FCC hoped to accomplish those diversity goals indirectly through correlation with the small business credits that remained. *See* Fritts, *supra* n. 340, at 861.

In other words, the use of spectrum auctions does not preclude the FCC from implementing social policy goals. Even where an auction is designed solely to maximize revenue, to the exclusion of other factors, it will produce revenue that can subsidize other less-profitable uses of the resource, This is precisely what we propose below for gTLD auctions.[385] The bottom line is that auctions do not subvert Congress' goal of promoting competition, localism and diversity. They may help advance it. But, expecting an allocation method alone to achieve these salutary goals is a mistake. We need only look at 70 years of FCC "beauty contests" to confirm that.

2. Market Allocation of Telephone Numbers

Telephone numbers are in short supply.[386] One obvious solution to that problem is to create more. This is easily accomplished (conceptually) by adding one or more digits to the current 10-digit string in the North American Numbering Plan. Of course this would be very expensive; cost estimates range between $50 billion and $150 billion,[387] and could take a decade or more to implement.[388] Everything from switches to routers, customer equipment, telephone books and databases would have to be upgraded. Current assignments of numbers to businesses and individuals would be disrupted. Stake-holder entitlements to such things as vanity numbers would have to be mediated.[389] The last time the FCC faced a similar problem, it opted not to change the familiar string.[390] Expansion is likely inevitable, but the FCC is holding off as long as possible.[391]

Another solution to short-term number scarcity is to more efficiently allocate and manage the existing supply. Accordingly, the

385. *See supra* pt. IV (A Proposed Model for Expansion of the Name Space).

386. *See supra* pt. III(B)(2) (Wireline Telephony).

387. *See* Numbering Resource Optimization, *supra* n. 279, FCC 99-122, at 5, n. 8 ("Preliminary estimates place the cost of NANP expansion between 50 and 150 billion dollars.").

388. *See id.* at 15-16.

389. *See, e.g.,* Toll Free Service Access Codes, *supra* n. 277 (adopting rules on the assignment of vanity numbers); Lock, *supra* n. 288.

390. The last time the length of telephone numbers was changed was in the early 1960s with adoption of All Number Calling. This change, which included replacing some 2-digit exchanges with three digit Central Office codes, standardized number strings across the US. *See* David H. Bench, *North American Numbering Plan (NANP) Expansion Reference Document* at 7 <http://www.atis.org/pub/clc/inc/nanpe/nanpe248.doc> (Jan. 2002).

391. Detailed studies looking at scope and transition are underway to determine when expansion will be necessary. Expansion should not be done frequently. Accordingly, one proposal is to add 2 digits to the dialing string, which would yield nearly 800 billion numbers in the NANP. *See, e.g.,* Industry Numbering Committee, *supra* n. 272, at 33.

FCC has made "numbering resource optimization" a high priority.[392] In a series of orders over the past few years, the Commission has adopted several administrative and technical measures designed to increase allocation and utilization efficiencies. Among these are: eliminating number reserves, decreasing block allocations, number portability, number pooling among telcos, and "anti-hoarding" standards. Other measures are under active review.

The most controversial, and likely most effective, mechanism for conserving numbers is to raise the price. Currently, telephone numbers are free. They are distributed to telcos at zero cost on a demand basis. Zero pricing has lead to gross allocative inefficiencies, as there is no disincentive for warehousing, waste or underutilization. All the costs of consumption are externalized. For example, "unified messaging services," such as voicemail and e-fax services, obtain vast pools of numbers for free and provide value-added services to customers often for free or below-market cost. Because of zero pricing at the wholesale and retail levels, these resources are used inefficiently, "potential[ly] . . . stranding millions of numbers."[393] Responding to this and similar problems, the FCC has stated its belief that "a market-based approach is the most pro-competitive, least intrusive way of ensuring that numbering resources are efficiently allocated."

Auctions provide a market-based approach aimed at optimizing the use of the scarce resource.[394] If auctions were implemented, telephone companies would be required to pay for, rather than obtain for free, allocated number blocks. Although the FCC is still seeking comments on how best to implement competitive bidding, this is likely the next step in managing the scarce telephone number space.[395] These auctions will be different from spectrum auctions in a significant respect. The FCC's goal is to "increase the efficiency of

392. *See* FCC 99-122.

393. *See* Reply Comments Of The Maine Public Utilities Commission, *In the Matter of Numbering Resource Optimization*, 7-8, CC Docket 99-200 <http://www.nrri.ohio-state.edu/nida/DocumentFiles/fnprm-reply.doc> (Jun, 9, 2000); *see also* Federal Communications Commission, *Implementation of Number Conservation Methods Authorized by the Federal Communications Commission*, Order No. 23, 454, at 8-9 <http://www.puc.state.nh.us/orders/2000ords/23454t.pdf> (May 1, 2000).

394. In part, this is because auctions are the best way to determine market price. *See* Second Report And Order, *supra* n. 271, at 373 ("regulators are incapable of setting the 'economically correct' prices") (quoting industry comments).

395. Auctioning telephone numbers was proposed by the Clinton Administration in its 1996 and 1997 budgets, estimating that an auction of new toll-free 888 numbers would raise $700 million over three years. Industry opposition to the proposal prompted Congress to reject it. *See* Lock, *supra* n. 288, at 389, n. 94.

numbering resource usage, and not to raise additional funds."[396] Thus, there may well be offsets to other telco fees and contributions, such as to the Universal Service Fund. Notwithstanding, the industry has reacted negatively to the FCC's pricing proposal, forcing the agency to explain its reasoning in detail.[397] It has yet to convince the industry, and yet to implement the proposals. But it will.

One problem facing the agency is how to treat the advantages of incumbency. The dominant theme of the 1996 Telecommunications Act is competition. Toward that end, Congress enacted a number of measures designed to ease entry into local exchange markets. Market pricing of telephone numbers could impede these efforts. Incumbent local exchange companies (ILECs) can exploit their natural monopolies to extract monopoly rents from customers (hence the drive to open those markets). In addition to being well-financed, ILECs often have large stockpiles of available numbers (which gives rise to the scarcity problem in the first place). If existing numbers are grandfathered, and competitor local exchange companies (CLECs) have to buy their numbers at auction, they may be doubly disadvantaged and unable to compete. The FCC is not insensitive to this problem and is working on "competitively neutral" pricing mechanisms.[398] Among these is a proposal to reject grandfathering and apply market pricing to the embedded number base.[399]

The purpose of this Part has been two-fold. First, we established substantial symmetry in economic terms between two traditional telecommunication industries and the Internet, focusing on scarcity and private good characteristics of the spectrum and the telephone name and number space on the one hand and the domain name space on the other. Second, we explored the various models that have been used by the FCC over the years for allocating scarce resources. Both with broadcast and telephony, the FCC came late to realize that allocative efficiency could best be accomplished through a market pricing mechanism—the auction. The fundamental lesson to be learned from the history of the FCC is that auctions are superior to comparative "beauty contest" hearings (broadcast licenses) and rules-of-first occupation (telephone numbers).

396. Second Report And Order, *supra* n. 271, at 372.

397. Spectrum auctions were mandated by statute, relieving the FCC from having to create a record in support of market allocation of radio licenses. *See supra* n. 349.

398. *See* Second Report And Order, *supra* n. 271, at 373.

399. *See id.* at 375.

The next step is to apply this lesson to the Internet. As we show in Part IV, adopting a competitive bidding model for allocation of generic top level domains both promotes efficient use of the name space and enhances its economic value. Since domain names are private goods, even if one conceptualizes the name space itself as a public resource,[400] market allocation is likely the most economically efficient and stable mechanism. No degree of social engineering by ICANN, under the banner of promoting the "public interest" in the DNS system, can come close. The only reason for retaining the present pace of free-form review of gTLD applications is to maintain the status quo. And the only reason to do that is to preserve monopoly privileges of incumbency.

IV. A Proposed Model for Expansion of the Name Space

As its name implies, ICANN's principle function is to regulate the name and number spaces of the Internet. Although the organization strives to govern by consensus,[401] there has never been agreement on how these spaces should be regulated. Indeed, other than ICANN governance itself, no other issue has generated more controversy and proposals for reform.[402] Whole organizations exist toward that end.[403] Yet, "little progress has been made because of both an extremely complex political environment and the economic interests of the parties involved in the multi-billion dollar business of selling domain names."[404]

It will take considerable effort to reform name space regulation. The problem is not unique to the Internet. We have seen other telecommunications industries go through similar upheavals. Our hope is that it will not take decades or longer, as it did with broadcast and telephony, to arrive at efficient allocation and utilization mechanisms. In this section we propose a model that has proved effective elsewhere—competitive bidding for scarce private goods.

400. For an excellent exposition of this point, *see* Chander, *supra* n. 216, at 756-58.

401. *See, e.g.,* ICANN, *ICANN Meetings in Rio de Janeiro, Brazil* <http://www.icann.org/riodejaneiro> (accessed Mar. 18, 2003) ("ICANN encourages broad participation in its bottom-up consensus-development process.").

402. *See, e.g.,* ICANN, *Overview of the DNS Controversy* <http://www.rkey.com/dns/overview.html> (accessed Mar. 18, 2003).

403. "The generic top level domain memorandum of understanding is the international framework in which policies for the administration and enhancement of the Internet's global Domain Name System (DNS) are developed and deployed." *See, e.g.,* gTLD-MoU, *Welcome to the gTLD-MoU Web Site* <http://www.gtld-mou.org> (Aug. 12, 1999).

404. gTLD-MoU Policy Oversight Committee, *Read This First!* <http://www.gtld-mou.org/> (accessed Aug. 12, 1999).

We think this could break the logjams that have characterized the addition of new gTLDs to the root. A paradigm shift is required to make this work. ICANN has to stop treating the name space as a public good – requiring strict regulation in the public interest. Once it recognizes that domain names are private goods, and allows market allocation, a more efficient system of name space management should emerge.

A. Treating Scarce Name Space as a Public Good—An Example of Regulatory Failure

Root service—the computer system that allows translation of URLs into computer-identifying IP numbers—is a natural monopoly.[405] The Internet would be fundamentally different, and likely a great deal less useful, if unifying control were absent. The monopoly characteristic of root service means, among other things, that entry into the root is tightly controlled. In Milton Mueller's terms, ICANN "rules the root."[406] In doing so, it endows and regulates a private good—the name space. Yet, it treats it as if it were a classic public good.

The domain name space has been declared a public resource.[407] And so it is, in the same way that the spectrum and the telephone numbering system are public resources. All three are mathematical constructs—addressing protocols—that require social buy-in to be practical. It is difficult to conceive of these constructs as reducible to private ownership, just as it would be to think of owning integers. Yet, the notion of public resource is not synonymous with "public good" as economists use that term. The distinction between public and private goods helps in policy analysis of regulatory structures. Public goods are not efficiently allocated by markets; hence they require government or government-like regulation. Private goods, on the other hand, are susceptible to market regulation, which is much more likely to achieve optimum efficiency in resource allocation.[408] We demonstrate these points by first recounting ICANN's

405. This is because of networking effects and a high ratio of fixed to marginal costs. *See supra* pt. II(C) (Networking Effects and the Root Service Monopoly).

406. *See* Milton Mueller, Ruling the Root: Internet Governance and the Taming of Cyberspace, 163-184 (2002) (discussing ICANN and namespace regulation).

407. *See, e.g., Opinion of the Governmental Advisory Committee on New Generic Top Level Domains* <http://www.icann.org/committees/gac/new-tld-opinion-16nov00.htm> (November 16, 2000).

408. For a thorough discussion of these points, *see supra* pt. II (An Economic Analysis of Domain Name Policy).

experiences with gTLD expansion, and second by looking at the contestable markets that exist in domain names.

1. ICANN and gTLD Expansion

At its annual meeting in November 2000, the ICANN Board considered 44 applications for new gTLDs that had been submitted under working rules devised by the DNSO and Names Council.[409] The Board accepted 7 of the proposals. The application process was complex, expensive and somewhat mysterious. Aspirants had to complete lengthy forms involving their technical and business plans, their internal structure, eligibility standards, market projections and dispute resolution policies.[410] They were advised to "secure now the professional assistance of technical experts, financial and management consultants, and lawyers to assist in [the] formulation of their proposals and preparation of the applications."[411] ICANN imposed a $50,000 processing fee, which also served to weed out the disfavored, weak, and undercapitalized applicants. Selection criteria were never fully articulated and the hearing at which applications were reviewed was, putting it mildly, unstructured.[412] Applicants had only one day to review staff recommendations before the hearing,[413] and only 3 minutes each to make their cases to the Board. Much of the Board's discussion was based on speculation or trivial factors, such as whether a TLD string was "pronounceable."[414] ICANN has acknowledged the subjective nature of the process, but has proclaimed that as one of its strengths.[415]

409. For an excellent narrative of this story, *see* Jonathan Weinberg, *ICANN as Regulator* (preliminary draft Sept. 2, 2001) <http://www.law.wayne.edu/weinberg/icannasregulator2.pdf> (accessed Dec. 17, 2003). Jon Postel, acting for the Internet Assigned Names Authority (IANA), established the original gTLDs in the 1980s.

410. *See* ICANN, *Description of the Review Procedure* <http://www.icann.org/tlds/tld-app-review-procedure-02oct00.htm> (Aug. 3, 2000).

411. ICANN, *New TLD Application Process Overview* <http://www.icann.org/tlds/application-process-03aug00.htm> (Aug. 3, 2000).

412. The hearing has been compared to "The Gong Show." *See* NTKnow, *Hard News* <http://www.ntk.net/2000 11/17> (accessed Nov. 17, 2000). It drew ire from the American Civil Liberties Union (ACLU) which, in a letter to Commerce Secretary, Norman Mineta, complained that "ICANN's decision making process was characterized by a large number of arbitrary decisions, process failures, and plain mistakes of fact." American Civil Liberties Union, *Letter to Norman Mineta from American Civil Liberties Union* <http://archive.aclu.org/congress/l011601a.html> (accessed Jan. 16, 2001).

413. *See* ICANN, *Report on New TLD Applications* <http://www.icann.org/tlds/report> (Nov. 10, 2000).

414. Weinberg, *supra* n. 409.

415. *Id.*

This is no way to make law, sausage or domain name policy.[416] Nonetheless, it is the only precedent for adding new gTLDs.[417] Perhaps because of it, ICANN has taken a much slower and more deliberate approach to considering further applications.[418] Many of the original 44, and some new ones, are still pending. Two years after the initial expansion, ICANN President Stuart Lynn issued *A Plan for Action Regarding New gTLDs*, proposing "up to three more sponsored TLDs," (sTLDs) and referral to a committee to "develop a recommendation on how to evolve the generic namespace . . . ."[419] At its December, 2002 annual meeting, the Board referred the Lynn proposal to the newly-formed Generic Name Support Organization (GNSO).[420] Constituency groups of the GNSO have put forward their own ideas. The Business Constituency (BC) argued for a "differentiated" or taxonomized expansion,[421] under which no new unsponsored or unrestricted gTLDs would be allowed. This drew fire from the Non-Commercial Users Constituency (NCUC) as "inimical to the interests of most domain name users."[422] A committee of the GNSO Names Council mildly endorsed the BC proposal and sent it back to the Board.[423] At the spring 2003 meeting in Rio de Janeiro,

416. With apologies to Otto von Bismarck. ("If you like law and sausages, you should never watch either one being made." *Respectfully Quoted* 190 (Library of Congress 1989).

417. At its meeting in Stockholm in June, 2001, the ICANN Board convened a New TLD Evaluation Process Planning Task Force (NTEPPTF) to "recommend processes for monitoring the implementation of the new TLDs and evaluating the new TLD program . . ." ICANN, *New TLD Evaluation Planning Task Force* <http://www.icann.org/committees/ntepptf.> (Apr. 13, 2003) (NTEPPTF issued its final report in July 2002.). *See* ICANN, *Final Report of the New TLD Evaluation Process Planning Task Force* <http://www.icann.org/committees/ntepptf/final-report-31jul02.htm> (July 31, 2002) [hereinafter NTEPPTF Final Report]. Note that NTEPPTF did not itself evaluate the 7 new gTLDs; it merely suggested tasks for an "Evaluation Team" to perform that function, together with an "on-going Monitoring Program." This is an excellent example of how bureaucracies function. The evaluation process is still underway.

418. *Id.*

419. *See* Stuart Lynn, *A Plan for Action Regarding New gTLDs* <http://www.icann.org/committees/ntepptf/new-gtld-action-plan-18oct02.htm> (Oct. 18, 2002).

420. *See* ICANN, *Preliminary Report* <http://www.icann.org/minutes/prelim-report-15dec02.htm> (Dec. 15, 2002).

421. *See* The Business Constituency, *A Differentiated Expansion of the Names Space* <http://www.bizconst.org/positions/Differentiatednamespace.doc> (Dec., 2002).

422. *See* Milton Mueller, *[ncdnhc-discuss] Proposed Statement on TLD Policy* <http://www.icann-ncc.org/pipermail/discuss/2003-February/006527.html> (Feb. 18, 2003). The authors of this paper also responded to the BC position paper. *See* Karl M. Manheim & Lawrence B. Solum, *The Inefficiencies of Differentiated Expansion: Analysis and Critique of the Business Constituency Position Paper on Expansion of the Top Level Name Space* <http://gtld-auctions.net/BC_Response.pdf> (Mar. 24, 2003).

the Board posted draft Criteria to Be Used in the Selection of New Sponsored TLDs, essentially incorporating the Lynn and BC proposals.[424] In customary form, the Board gave the public one day to respond. Perhaps unexpectedly, strong objections were filed by the deadline, followed by oral comments to the Board.[425] Finally, on December 15, 2003, ICANN released a "Request for Proposals" (RFP) for new gTLDs, called "sponsored" top level domains or sTLDs.[426]

Given the parameters of the RFP, the next round of gTLD expansion will be limited to "sponsored" domains (e.g., ".union") with restricted eligibility,[427] rather than open and commercially oriented ("unsponsored") domains such as ".web." This will serve to maintain scarcity in the name space and the resulting monopoly value of existing domain names and gTLDs. Incumbent registry operators and registrants will again be the winners of this round of gTLD expansion; competitors and consumers will again be the losers. And despite the now familiar refrain of "serving the public interest," the proposal actually achieves the opposite. Because of eligibility criteria, the two or three new "sponsored" gTLDs are likely to be "well-financed globalized non-profit membership organizations [rather than] regional, relatively poorer institutions that serve the needs of communities in the third world."[428] This is how public choice theory works; organized special interests work to defeat regulatory reform that would benefit the public.[429]

423. *See* ICANN, *GNSO Council gTLDS committee v3* <http://www.dnso.org/dnso/notes/20030410.gTLD.committee.conclusions-v3.html> (April 2003).

424. ICANN, *ICANN Rio de Janeiro Meeting Topic: Criteria to Be Used in the Selection of New Sponsored TLDs* <http://www.icann.org/riodejaneiro/stld-rfp-topic.htm> (Mar. 25, 2003).

425. *See* Karl M. Manheim & Lawrence B. Solum, *sTLD Beauty Contests: An Analysis and Critique of the Proposed Criteria to be Used in the Selection of New Sponsored TLDs* <http://gtld-auctions.net/sTLD_Analysis.pdf> (Mar. 26, 2003); Michael Froomkin, *ICANN Watch, Same Old Shell Game All Over Again*, at <http://www.icannwatch.org/article.pl?sid=03/03/26/0451239&mode=thread> (Mar. 25, 2003). Submitted responses to the ICANN proposal are collected at *Submissions to the stld-rfp-comments forum* <http://forum.icann.org/riodejaneiro/stld-rfp-comments/general/index.html> (accessed Dec. 17, 2003).

426. See *ICANN Releases Request for Proposals for Sponsored Top Level Domain Names*, at <http://www.icann.org/announcements/announcement-15dec03.htm> (accessed Feb. 4, 2004). The six-part sTLD application can be found at <http://www.icann.org/tlds/new-stld-rfp/new-stld-application-parta-15dec03.htm> (accessed Feb. 4, 2004).

427. *See id.*, NTEPPTF Final Report, *supra* n. 417, at pt. 4.

428. Manheim & Solum, *supra* n. 425, at 2.

429. *See generally* Daniel A. Farber & Philip P. Frickey, *Law and Public Choice: A Critical Introduction* (1991).

ICANN's behavior in connection with regulation of the name space is analogous to "agency capture," the phenomenon where an agency becomes "uniquely susceptible to domination by the industry [it is] charged with regulating."[430]

> In 'captured' agencies, agency regulators do not act as 'arms-length' representatives of some larger 'public interest' in their interactions with regulated industries. Instead, government officials work to advance the agenda of current firms in the industry by formulating regulations that benefit or at least do not substantially burden the industry. In the most malignant capture account, the captured regulatory agency enables an industry to bar new entrants and [to] extract monopoly rents so that consumers are materially worse off with regulation than without it. Capture of this sort, theorists claim, is particularly likely when an agency is charged with regulating only a single industry.[431]

In the case of ICANN, the influence of those who are affected by ICANN's actions is facilitated by the newly adopted governance structure with built-in influence of "constituencies."[432] These, for the most part, are the incumbent stake-holders—the trademark holders, large telcos, ISPs, and registration service providers that would be most disrupted by expansion of the name space. To be sure, ICANN is not a government agency, but it wields regulatory power nonetheless.[433] Indeed, it superintends a monopoly as strong as any the FCC or most state public utilities commissions ever has.

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430. Thomas W. Merrill, *Capture Theory and the Courts: 1967-1983*, 72 Chi.-Kent. L. Rev. 1039, 1043 (1997).

431. David Dana & Susan P. Koniak, *Bargaining In The Shadow Of Democracy*, 148 U. Pa. L. Rev. 473, 497 (1999).

432. More specifically, under the new bylaws, the ICANN Board is selected by a Nominating Committee which is comprised, de minimis, of "constituency" representatives. These include: the Business Users Constituency (2 members), the gTLD Registry Constituency, gTLD Registrars Constituency, the Internet Service Providers Constituency, the Intellectual Property Constituency, and the Non-commercial Users Constituency. *See* ICANN, *Appendix A to Minutes ICANN Board Meeting in Shanghai, Art. X, sec. 5* <http://www.icann.org/minutes/minutes-appa-31oct02.htm> (Oct. 31, 2002).

433. Tamar Frankel, *The Managing Lawmaker In Cyberspace: A Power Model*, 27 Brook. J. Intl L. 859, 860 (2002) ("ICANN establishes some of the Internet's constitutive rules that facilitate universal connectivity. It has used its power to determine the process under which new top-level domain names ('TLDs') are allocated. To this extent it is a lawmaker." (citation omitted)) *see also* Jonathan Zittrain, *ICANN: Between the Public and the Private—Comments Before Congress*, 14 Berkeley Tech. L.J. 1071 (1999).

The FCC was also "captured" by the industries it regulated.[434] This is one reason Congress began deregulating the telecommunications industries in 1996 with the Telecommunications Act.[435] The following year, Congress extended frequency auctions to broadcast licenses. As much of this article suggests, we believe ICANN should follow this course. It should do so not simply because it would ameliorate capture or produce revenues, although it would accomplish both of those. Rather, it should do so because market allocation of private goods—in this case, the domain name space—is a more efficient way to manage them. Auctions would insure that specific gTLDs in particular and the name space in general would be put to their highest and best economic use.

2. The Market for Scarce Name Space

The second level domain (SLD) name space is scarce. A huge number of domain names remain available—the theoretical dimensions of even the SLD space in the .com TLD alone are vast. But, the most desirable domains are those which are both easy to remember and which also have commercially exploitable symbolic, generic or trade meaning. Many, perhaps most, of the potential SLDs in this subgroup have already been registered. That scarcity creates value, which in turn creates a market where values can be realized. With most domain names, the market exists only at the secondary level; i.e., "used" names can be bought and sold among registrants, sometimes for millions of dollars.[436] Domain name brokers, appraisal services and online auctions can facilitate the transactions.[437] In a few

434. *See* Wendy M. Rogovin, *The Regulation of Television in the Public Interest: On Creating a Parallel Universe in Which Minorities Speak and Are Heard*, 42 Cath. U. L. Rev. 51, 70 n.68 (1992) ("Making a case for 'agency capture' is not difficult with respect to the FCC . . . the FCC has, historically, strongly favored the industry 'players.'").

435. Pub. L. No. 104-104, 110 Stat. 56 (1996) ("To promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies.").

436. For instance, the value of "sex.com" has been estimated at $65 million. *See* Anupam Chander, *The New, New Property*, 81 Tex. L. Rev. 715, 728 (2003). Business.com was sold in 1999 for $7.5 million; america.com was offered for $30 million. *See* MSNBC, *Cool.com: Most Valuable Domain Name?* <http://zdnet.com/2100-11-519606.html?legacy=zdnn> (Mar. 30, 2000). HitDomains.com, a domain name auction site, has claimed an average domain name price of $1.6 million. *See* Kevin J. Heller, *The Young Cybersquatter's Handbook: A Comparative Analysis of the ICANN Dispute*, 2 Cardozo Online J. Confl. Resol. 2, n. 160 (2001).

437. *See, e.g.*, DomainSystems.com, *About DomainSystems* <http://www.domainsystems.com/ds.htm> (accessed Feb. 22, 2003) (The site claims to have "developed the very first domain appraisal algorithm and formula that is now used in more than 85

cases, mostly in the ccTLD space (such as .md, .tv and .us), a primary market functions at the retail level. Profit-maximizing TLD operators extract monopoly rents by charging a premium for popular second level domains drawn from generic terms, common names and nouns.[438] The economic value created by scarcity is thus monetized. In this unregulated environment, windfalls go to the registry operators or first-in-line registrants during the inevitable land rush.[439]

The TLD name space is also scarce, for the same reasons that scarcity exists in the SLD. Yet, there is no market for gTLDs despite their tremendous economic value, in one case (.com), denominating an entire industry.[440] gTLD operators acquire their rights and resulting value either by being in the right place at the right time (e.g., *Network Solutions, Inc.*, the first .com registry), or by the grace of ICANN. In neither case did the operators have to pay for their exclusive rights, other than perhaps administrative processing and lobbying fees. ICANN, as keeper of the root, has systematically failed to capture value at the wholesale level. Instead, registry operators have obtained windfalls worth hundreds of millions of dollars or more. The stock value of Network Solutions was estimated to be $21 billion when it was acquired by Verisign.[441]

The current round of gTLD expansion is following the same model. ICANN will make bureaucratic and well-intentioned efforts to promote the Internet community's interests by assuring smooth administration of the root and name space. It will not, however, realize any monetary benefit from the new value it creates. It will

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percent of all domain appraisals performed on the web, and we have performed more than 350K appraisals to date."). There are over 250 web sites for domain auctions, appraisal services, brokers and mass sellers of SLDs. *See* DMOZ, *Open Directory Project* <http://dmoz.org/Computers/Internet/Domain_Names/For_Sale_or_Auction> (accessed Apr. 20, 2003).

438. *See* Peter B. Maggs, *The ".us" Internet Domain*, 50 Am. J. Comp. L. 297, 311-12 (2002).

439. Creating a primary market isn't necessarily an easy task. The operator of the .biz TLD was sued for violating a California law prohibiting lotteries. *See* ICANN, *Smiley v. ICANN* (Los Angeles Superior Court No. BC 254659) <http://www.icann.org/announcements/advisory-29dec02.htm> (accessed Feb. 13, 2003) (class action against ICANN, NeuLeval, and others, for running criminal lottery enterprise in the sale of .biz SLDs).

440. Again, ccTLDs provide a special case since each country regulates its own country-code top level domain. Some have sold their rights to private for-profit operators, *e.g.*, .tv. *See Domain Name Glossary*, <http://www.igoldrush.com/glossary.htm> (accessed Feb. 13, 2003); *UK Domain Name Search: Country Code Top Level Domains*, <http://www.uk-domain-names-search.co.uk/cctld-list.htm> (accessed Feb. 13, 2003).

441. *See* David E. Kalish, *VeriSign Buys Network Solutions for $ 21 Billion*, Chi. Sun-Times 4 (Mar. 7, 2000).

instead endow a lucky few successful applicants with monopolies they can monetize at the retail level. ICANN's conduct today parallels that of the FCC during the era of comparative license hearings. It tries to evaluate applicants on the basis of "public interest" criteria,[442] knowing full well that behind the scenes a game of "Who Wants to be a Millionaire" is being played out. If the root is a public resource, then ICANN should not be so generous. Instead, it should adopt a system of competitive bidding, drawing on recent FCC policies and experience for guidance.[443]

B. Competitive Bidding for New gTLDs

When new radio frequencies become available for commercial use, federal law requires that licenses be auctioned off to the highest qualified bidder.[444] The FCC does a reasonably good job in designing and conducting spectrum auctions. They are often familiar in format, not much different than found for consumer goods on eBay.[445] In other cases, such as with "Simultaneous Multiple-Round"[446] or "combinatorial bidding," the auction design is fairly complex.[447] Because of complexity in these cases, the FCC sponsors periodic conferences on auction theory and seminars on auction mechanics for potential bidders.[448]

442. These criteria fall into four general categories: technical, business, legal and process. *See* NTEPPTF Final Report, *supra* n. 417.

443. The proposal contained here covers only new gTLDs, not assignment of SLDs within the new hierarchies. Admittedly, that is not an insignificant problem. Once a new TLD is approved, registrars (and perhaps ICANN) will need to consider claims of right to secondary names. We expect the familiar concerns of trademark and incumbency (in parallel gTLDs) to dominate any such consideration. But, in principle, such claims will be no different for gTLDs created under this model than they would be for any mechanism expanding the domain name space, or for that matter existing gTLDs.

444. *See supra* n. 349 and accompanying text.

445. eBay in fact has served as a secondary market for licenses, which can be transferred upon the sale of a broadcast station. For instance, AM station WGAB in Evansville, Indiana, was for sale on eBay in February, 2003. The asking price was $2 million. *See* Radio Magazine, *WGAB Evansville for Sale on Ebay,* <http://beradio.com/ar/radio_currents_17/> (Jan. 27, 2003). Two low-power TV stations were auctioned off in January, 2003. *See* William LaRue, *Watertown TV Stations For Sale On Ebay*, The Post-Standard (Jan. 10, 2003) <http://nl.newsbank.com/nl-search/we/Archives?p_action=list&p_topdoc=11&p_maxdocs=210>.

446. This is the primary auction format used by the FCC. *See* Fritts, *supra* n. 340, at 857.

447. All FCC auctions are conducted electronically over the Internet. *See* FCC, *About Auctions: Auction Designs* <http://wireless.fcc.gov/auctions/about/auctiondesigns.html> (Sept. 12, 2001).

448. The FCC also maintains an extensive auction web site. *See* FCC, *Auctions* <http://wireless.fcc.gov/auctions> (Feb. 10, 2003).

Compared to spectrum auctions, we believe gTLD auctions will be relatively simple, both in concept and operation. Nonetheless, we think actual auction design should be worked out by ICANN to assure compatibility with technical standards and to maximize economic efficiency. ICANN can draw on the FCC's operational experience with auctions as well as a large body of literature on auction theory and design.[449] Although we describe an auction model below, we do not propose that ICANN accept it based on our analysis alone. Rather, our purpose here is to lay out a framework, describing what should be auctioned and roughly how.[450] The actual process of auction design should include input from economists who specialize in auction theory;[451] indeed, ICANN should either hire a staff economist or develop a consulting relationship with an economist specializing in auction design.[452]

1. What Should Be Auctioned?

Unlike the allocation of radio licenses or telephone numbers, where the relevant space is identified prior to issuance, the domain name space is constrained only by the allowable character set and string length.[453] Thus, allocation of gTLDs involves selection both of

449. *See, e.g.*, Paul Klemperer, *Auction Theory: A Guide to the Literature*, 13 J. Econ. Surveys 227 (1999) (available at <http://www.nuff.ox.ac.uk/users/klemperer/Survey.pdf> (accessed Jan. 4, 2004)); Paul Klemperer, *Using and Abusing Economic Theory* <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=379242> (February 2003); Cramton, *supra* n. 337. In this paper we assume that ICANN would itself conduct the auction. However, it need not. It could outsource the actual operation to a private party. There may be several advantages of privatizing the auction process, not the least of which is enlisting expertise in an area unfamiliar to a non-profit corporation.

450. As this article was nearing completion, we learned of a similar policy proposal by Milton Mueller and Lee McKnight, *The Post-.COM Internet: A Five-Step Process for Top Level Domain Additions* <http://dcc.syr.edu/miscarticles/NewTLDs-MM-LM.pdf> (Mar. 19, 2003). We endorse much of the analysis in that paper, which contains somewhat different and more detailed auction mechanics than here. To the extent the two proposals propose different auction designs, this reinforces our suggestion that ICANN should seek independent advice from qualified economists on the auction design issues. However, the fact that we have approached the issue of gTLD expansion from different perspectives, but reached nearly identical conclusions, reinforces the soundness of the core idea that is shared by both proposals—gTLD auctions represent the best mechanism for expansion of the root.

451. In mandating spectrum auctions, Congress also required the FCC to "design and test multiple alternative methodologies under appropriate circumstances." 47 U.S.C. § 309(j)(3) (2000). ICANN should do likewise.

452. In addition to the theorists listed in Klemperer, *supra* n. 449, specialists at the FCC are likely available to ICANN for consultation on auction design.

453. The only restriction is that the English alphabet be used. However, the new IDNS system is backwards compatible—it allows a user to register non-English characters, such as Arabic or Chinese, and IDNS converts the characters to ASCII so that the system

domain names and sponsors or operators. The former is analogous to the radio frequency band or telephone number set; the latter are the licensees. FCC spectrum auctions, until now at least, have determined only licensees. Determination of the frequencies to be awarded (the "auction inventory"), or their permitted uses, is subject to pre-auction administrative processes.[454] Adapting this practice to gTLDs means that, prior to auction, ICANN would first determine the domain name or names to be added. An auction would then select the operators of the newly approved gTLDs. For example, ICANN might decide to add .sex to the name space, and then hold an auction solely to determine the registry operator. While this mechanism might facilitate gTLD expansion, and would certainly produce revenue, it does not address the principal nature of inefficiency now encumbering the gTLD selection process.

It is unrealistic to expect ICANN to rationally determine which gTLDs should be added to the root. There are few if any objective selection criteria. Does a gTLD need to be pronounceable or have semantic meaning? Does it need to be descriptive? These questions, while sensible in the abstract, are not germane to the question at hand any more than whether nouns and adjectives are eligible to become gTLDs. In one notorious case, the ICANN Board selected .aero over .air because it felt the latter was a public resource.[455]

The principle at play during the first expansion round in 2000 was "proof-of-concept" domains.[456] As useful as that might sound for evaluating many aspects of expansion, including root operation, allocation methods, and even individual applicants, it is not a meaningful tool in distinguishing among possible gTLDs. In fact, there may be no rational policy choices. Regulatory decisions on which gTLDs to add are inevitably arbitrary, or simply favor particular interest groups. The highly engineered grid of gTLD assignments that marks the current domain name space does not necessarily measure or meet the needs of the Internet community.

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is inter-operable with the DNS. *See* Universal-Names.com, *Frequently Asked Questions* <http://rib.universal-names.com/media10/cgi-bin/loadpage.pl?page=../faq.html> (accessed Feb. 18, 2003).

454. *See, e.g.*, FCC, *Public Notice: Revised Inventory and Auction Start Date for Auction of Lower 700 MHz Band Licenses*, DA 03-100 <http://wireless.fcc.gov/auctions/data/bandplans/700lower.pdf > (Jan. 29, 2003).

455. *See* Scribe's Notes, *ICANN Board Meeting - November 16, 2000 - Los Angeles, California* <http://cyber.law.harvard.edu/icann/la2000/archive/scribe-icann-111600.html> (Nov. 16, 2000).

456. *See* Weinberg, *supra* n. 409, at 25.

Why not let the market decide? If .air has greater utility to the Internet community than .aero, why shouldn't it be added? Why not add both? To be sure, some users may enter .air when they are looking for .aero. And some domain holders might be induced to protect their trademarks or investments by buying domains in multiple gTLDs (so-called "defensive registrations"). But, those inefficiencies occur now, and are presumably reflected in the value of the gTLDs themselves. In short, the auction process should be structured so the question of which gTLDs to add is itself determined by the market.[457] This is likely to yield a higher and better use of the name space than would be achievable by any bureaucracy. The experience of the FCC with "flexible spectrum" allocation strongly supports economic theory on this point.

Closely related to the question of which gTLDs should be added is the issue of how many should be authorized at any time. Here ICANN must play an important role. Integrity of the root and domain name system is its *raison d'être*. Unlimited or too-rapid expansion could overwhelm both the infrastructure and the markets that have developed based on existing practices. It could also undermine the goals to be achieved by competitive bidding in the first place. Instead, ICANN should make an informed judgment, based on technical and public policy factors, on how fast to expand the domain name space. But their decisions must be transparent, so as to avoid any suspicion that stakeholders are manipulating the auction process so as to maintain scarcity or protect incumbents. In expanding radio bands or telephone numbers, the FCC is faced with real-world technical constraints. ICANN needs to articulate similarly objective criteria for any decision reached on how many gTLDs to add.

In this respect, "proof-of-concept" is a prudent policy. We think ICANN can legitimately limit the first round of gTLD auctions to a technically and administratively manageable number. If for no other reason, the model and economics need to be tested. There were 44 serious applicants for new gTLDs in December, 2000, each anteing up

457. As described by Yochai Benkler in the context of spectrum allocation, "auctions in and of themselves, without flexible use rights, are but a pale shadow of real market-based allocation." Yochai Benkler, *Some Economics of Wireless Communications*, 16 Harv. J. Law & Tech. 25, 27 (2002). The analogy for the domain name space is to release gTLD specification from administrative determinations and let the market decide which ones have optimal utility. Or as Karl Auerbach has put it, "the question of new TLDs [is] not as a question of names but rather of slots." Karl Auerbach, Cavebear Blog: *Why Lotteries Are Better Than Auctions When Distributing New TLD Slots* <http://www.cavebear.com/cbblog-archives/000016.html> (accessed Apr. 4, 2003).

the $50,000 application fee.[458] Several more applicants have emerged since then. We believe this number—roughly 50—provides a suitable lodestar figure for ICANN to consider.[459] Presumably, the root server system can support this number of new gTLDs. And if ICANN's cumbersome selection process were replaced by an auction, no significant administrative burdens would be encountered.[460]

What should be the duration of the right, purchased at auction, to operate a gTLD? Should it be like a spectrum license which has a prescribed term (e.g., eight years for broadcast licenses), and renewable thereafter? Or should the right be perpetual? One advantage licensing has over outright sale is the oversight it forces at renewal time. ICANN's agreement with Verisign for operation of the .com, .org, and .net registries was for eight years, with no mention of renewal.[461] We think this is a suitable term, but that a renewal

458. Several hundred new gTLDs were proposed by the applicants. *See ICANN*, *supra* n. 201.

459. Mueller and McKnight suggest 40 in the initial round. *See* Mueller & McKnight, *supra* n. 450, at 2 (proposing addition of "40 top-level domains to the Internet domain name system on an annual basis"). McKnight and Mueller's proposal differs from ours in that they suggest an initial round of 40, ten fewer than we propose, and they suggest that the same number be auctioned on an annual basis. We suggest that the first auction be evaluated by independent economists with auction design experience, and that subsequent auctions be designed at that stage. These differences are at the level of detail and do not reflect a fundamental difference in principle. We emphasize the importance of consulting independent economists with auction design expertise because of difficulties we perceive in the ICANN policy formulation process. *See infra* pt. V(A) (Auctions and the ICANN Process). We do believe that it would be unfortunate if the various constituencies and supporting organizations under ICANN's umbrella were permitted to take either our proposal or the Mueller and McKnight proposal as a baseline and then go through a bargaining process that would end in the adoption of a consensus auction design. The danger that the consensus proposal would facilitate the cartelization of bidders can be minimized if the auction design itself is developed by independent economists answerable directly to the ICANN board. Their recommendations and the board's deliberations should be fully transparent. *See* Paul Hoffman, *Reforming the Administration of the DNS Root* <http://www.proper.com/ICANN-notes/dns-root-admin-reform.html> (April 25, 2002) (proposing 25 new gTLDs every six months).

460. Administrative costs could be recouped, either by establishing a minimum bid or by requiring bidders to pay a fee—for example $5,000. In addition to determining the amount of the fee, ICANN would also need to determine whether the fee would be refundable to losing bidders. Although these decisions may seem arbitrary, this is not necessarily the case. A bidding fee could affect the yield from the auction, or serve as a barrier to auction entry. ICANN should consult with an auction design specialist in making any decision regarding a bidding fee or minimum bid.

461. *See* ICANN, *ICANN-NSI Registry Agreement*, <http://www.icann.org/nsi/nsi-registry-agreement-04nov99.htm#23 > (Nov. 10, 1999) (superceded by *Agreement for Restructured Relationship with VeriSign*, <http://www.icann.org/tlds/agreements/verisign/verisign-restructured-relationship-agmt-16apr01.htm> (April 16, 2001), which had the same termination date).

expectancy will enhance the price paid and capital investment of new gTLDs. The right should also be revocable upon material breach of an agreement with ICANN for the stable operation of the gTLD. So long as the rules are transparent and term security is worked out in advanced, the auction should function smoothly.

One objection to an auction for new gTLDs is that incumbent registry owners get a free ride. The question is whether the existing gTLDs should also be auctioned, either in the first round or when their agreements with ICANN expire. Otherwise, the argument goes, they would have an advantage over competitor gTLDs because their acquisition costs were much lower. The half-dozen existing commercial gTLDs could be auctioned as part of the expansion, either by ICANN (perhaps with delayed transfer to reflect extant agreements) or by the private operators as part of a double-sided auction.[462]

For a variety of economic and practical reasons, we think incumbent registry owners should be grandfathered in, at least in the current round. First, they are already likely to take a significant hit with large-scale expansion of the root through loss of monopoly power and rents. Second, their pricing structure for SLDs, often for long terms, was set in reliance on making annual payments to ICANN rather than paying a capitalized up-front purchase price. Finally, the incumbent gTLDs have enormous influence on ICANN's decision-making process. That reality of "regulatory capture" cannot be ignored in restructuring gTLD expansion policies. If incumbent expectancies were suddenly unsettled, it is less likely that the necessary paradigm shift would be approved.

In sum, we propose that ICANN authorize a first-round auction of 50 new gTLDs, for renewable terms where both the specific gTLDs and their operators would be selected by competitive bidding. We next show how the process might work.

2. Auction Framework

Although auctions were used by ancient societies, they have gained considerable attention in recent years among economists and mathematicians, striving to test game theory and theories of market pricing, formation and mechanics.[463] Often there are asymmetries of information, or unknown quantities (such as future revenue streams),

462. *See* Kwerel & Williams, *supra* n. 358, at 24 (provides discussion of a double-sided public-private auction for spectrum licenses).

463. *See generally* Klemperer, *Auction Theory, supra* n. 449.

which make precise market pricing impossible. An auction is a good way to interact amidst uncertainty; hence their attraction for game-theoretic analysis.

Once the rationale of auctions has been accepted, the next issue is their design. There is a rich body of work on this, both theoretical and empirical.[464] "What really matters in auction design are the same issues that any industry regulator would recognize as key concerns: discouraging collusive, entry-deterring and predatory behavior. In short, good auction design is mostly good elementary economics."[465]

The literature generally describes four basic types of auctions:

- the *ascending bid auction* (bids increase as participants drop out until only one is left);
- the *descending bid auction* ("Dutch auction") (offering price starts high and is lowered in successive rounds until one bidder accepts the price);
- the *first-price sealed-bid auction* (each bidder submits a single bid without seeing any others; the highest bidder wins); and
- the *second-price sealed-bid auction* ("Vickrey auction") (as above, but the highest bidder pays the price of the second highest bid).[466]

Ascending bid auctions are the most common and are probably the easiest to implement, especially given the nature of the bidding we propose (highest bids determine not only which parties gain slots but also which party gets a slot on which more than one party bids. However, they are also prone to collusion, as Klemperer demonstrates.[467] They can also discourage entry by risk-adverse bidders—those for whom perceived overbidding (called the "winner's curse") would be costly. In ascending bid auctions, participants with an advantage or greater perceived staying power, can not only win, they can win at a low price by discouraging participation by others. Developing an advantage through tactical measures (e.g., intimidating

464. Other advocates of gTLD auctions have also proposed ideas for auction design. *See, e.g.,* Hoffman, *Reforming the Administration of the DNS Root*, *supra* n. 459; Internet Democracy Project, *Answers from Emerson Tiller* <http://www.internetdemocracyproject.org/IDPanswerstiller.htm> (last modified Sept. 25, 2000).

465. Paul Klemperer, *What Really Matters in Auction Design*, at 2 <http://www.nuff.ox.ac.uk/users/klemperer/wrm6.pdf> (Aug., 2001).

466. *See* Klemperer, *Auction Theory*, *supra* n. 449, at 4-5. Mueller and McKnight suggest a form of Vickery auction under their proposal for gTLD expansion. They would determine the 30 highest bids by ascending price, but all winning bidders would pay the bid price of the lowest winning bid. *See* Mueller & McKnight, *supra* n. 450.

467. *See* Klemperer, *Auction Theory*, *supra* n. 449, at 3-4.

competitors) or predation can be profitable.[468] Sophisticated bidders prepare in advance to "game the auction."[469]

Many of these pitfalls can be mitigated by proper design and mechanics. Low entry barriers, high reserve prices, minimum increments, and enforced rules (e.g., collusion and cartel formation) can help secure the validity of the auction. Misbehaviors are minimized in our model by the variable identity of the good sold (artificially low bids for any particular gTLD will be surpassed by bidders for other names; neither the low bid nor its proffered gTLD will win).[470] "Punishing" anticompetitive behavior is an important safeguard.

The benefits of an ascending price auction have been demonstrated in the case of spectrum auctions.[471] This format tends to "allocate the prizes to the bidders who value them the most,"[472] thus achieving the prime desideratum—an efficient outcome. Especially in open multi-unit auctions, as we propose, ascending auctions allow for greater information exchange among bidders, thus reducing risk aversion.[473] Attractiveness to bidders is a key element of successful auctions.

Finally, an ascending auction with a specified ending time can reap some of the advantages provided by a sealed-bid auction without that format's principal disadvantage—disgruntled buyer or seller in the event of outlying (grossly high or low) bids.[474] Toward the end of bidding time in a fixed length auction, serious bidders tend to make a last best offer—thus, effectively simulating the so-called English-Dutch auction (combining an initial ascending open-bid phase with a subsequent first-price sealed-bid phase). Perhaps it is no accident that eBay, the world's largest auction house, uses an ascending auction with the safeguards and features described here. Accordingly, that is the structure we propose as a baseline for the process of designing the first gTLD auction.

468. *See id.* for a fuller analysis of these points.

469. *Id.* at 9.

470. For instance, if bidders A and B agreed in advance to low bid a gTLD, it would likely finish outside the top 50; hence it would not be approved.

471. *See* Crampton, *supra* n. 232, at 2-3.

472. Klemperer, *Auction Theory*, *supra* n. 449, at 12.

473. *Id.*

474. *Id.* at 15.

Eligibility and Standards

In most auctions, only qualified bidders are eligible to participate. The auction house needs to satisfy itself that the bidder has means to pay or is credit-worthy, is lawfully entitled to take possession and use the item, and hasn't engaged in collusion or anti-competitive behavior in the past. On eBay, for instance, bidders must pre-register and their bidding history is available for all to see. At FCC auctions, bidders must pre-qualify[475] to show they meet license eligibility requirements. They must also make upfront payments to assure financial ability. We think ICANN should similarly set eligibility standards to pre-qualify bidders prior to auction. These standards would be mostly of a technical and financial character. In fact they need not be significantly different than those in effect now. gTLD operators should have a registry plan in place, be technically competent to provide robust domain name services (or contract with a third-party to operate the name servers, zone files, and other technical services),[476] and be adequately capitalized.

One could take the contrary position that anybody should be able to participate in the auctions; whether they ultimately are allowed to operate the gTLD is a separate matter. For instance, a successful bidder at an auto auction is not guaranteed the right to drive the car off the lot. She must also have a driver's license. But that approach overlooks ICANN's role as superintendent of the root and domain name system. It has a public trust responsibility to information providers and users alike. That is best discharged by insuring that gTLD bidders can actually provide the name services they claim to offer.

One eligibility requirement deserves special mention – the right to use a trademark as a gTLD. An entire industry, consisting of a special purpose law—the Anticybersquatting Consumer Protection Act (ACPA)[477]—and an arbitration procedure—Uniform Domain-Name Dispute-Resolution Policy (UDRP)[478]—is built on trademark

475. *See* FCC, *Form 175: Application to Participate in an FCC Auction* <https://auctionfiling.fcc.gov/form175/index.htm> (accessed Feb. 18, 2003).

476. As others have observed, there is no reason why the proprietor, or manager, of a gTLD must also be the operator. Pre-qualified registry operators can manage back end technical operations and contract their services to gTLD proprietors. In fact, ICANN could qualify contract registry operators as part of a structured root expansion. *See Business Constituency, supra* n. 208 and accompanying text.

477. 15 U.S.C. §1051 et seq. (2000).

478. ICANN, *Uniform Domain-Name Dispute-Resolution Policy* <http://www.icann.org/udrp/udrp.htm> (Aug. 26, 2001).

usurpation in domain names. Up until now, this problem has arisen only with SLDs. But trademarks such as .ibm have been proposed as gTLDs. To avoid involving the auction process in trademark litigation, ICANN should assure that bidders for trademarked gTLDs have the right to use them. It could do this by adopting a "sunrise policy;" i.e., a gTLD reservation process limited to trademark owners. The National Telecommunications and Information Administration (NTIA) recently set a similar requirement for SLDs within the .us country code TLD.[479] But we see no reason trademark owners should get a free ride in the allocation of gTLD space. Nor should trademarks necessarily prevail over other gTLDs, at least in the limited first round of gTLD expansion by competitive bidding. Accordingly, while a trademark owner may be the only one lawfully entitled to operate a trademarked gTLD, it should compete in auction for the right to do so.

ICANN should also set a reserve price. This serves several purposes. Among them are: discouraging collusion, recovering costs of administrative overhead, generating revenue, maintaining minimum values in the name space,[480] assuring financial ability, and avoiding speculation (super cybersquatting). We think the processing fee charged to applicants in 2000 ($50,000) serves as a good baseline reserve price.[481] The precise amount, as well as eligibility standards and auction mechanics, should be determined by ICANN through referral, notice and comment, as it does now with policy initiatives. The collective judgment of the Internet community can shed substantial light on specific auction parameters beyond the framework we have described. We next illustrate how the auction would work.

479. *See* Brian Kahin, *Making Policy by Solicitation: The Outsourcing of .us* July 16, 2001 <http://icannwatch.org/essays/kahin.htm> (accessed Feb. 22, 2003).

480. One advantage of opening up the domain name space is to vitiate the monopolies created by artificially-created scarcity. Nonetheless, many existing stakeholders have developed reasonable investment-backed expectations. These should not be wiped out unnecessarily. A measured pace of expansion will give those who relied upon quasi-monopolies in the name space an opportunity to at least partially amortize their investments.

481. According to Klemperer, game theory also enters into the calculus of setting reserve prices. In standard auctions, setting a "reserve price equal to the seller's cost is revenue maximizing for the seller." *Auction Theory: A Guide to the Literature, supra* n. 449, at 22. Here, however, ICANN has no cost of goods other than its administration of the root and operational expenses (including running the auction itself). We presume $50,000 is a good first approximation of those costs, based on round 1 in Nov. 2000, but other reserve prices could be argued for equally forcefully.

Sample Auction

Assume, for the sake of illustration, that 100 bidders meet eligibility standards and participate in the auction.[482] When bidding starts, each participant can offer one or more gTLDs together with a bid amount.[483] For instance, a Hollywood entrepreneur might make an opening bid of $250,000 for the right to operate .movie. Some bidders may be content to bid on gTLDs already on the bid list, rather than proffer their own. Other bidders will have a unique claim to a gTLD. For instance, if IBM proposes .ibm, no other bidder would be qualified to operate it. One might expect IBM to offer the reserve price ($50,000) and not a cent more, confident that no one else can outbid it. But $50,000 for .ibm might not be one of the top fifty bids, in which case, that gTLD would not be approved.

Bidding would take place in public over the Internet, much the same way that other on-line auctions are conducted. Between the open and close of bidding, all bids would be listed, showing rank, gTLD, amount, and bidder. It would hypothetically look something like this (only six shown):

Time remaining: 1 day, 16 hrs, 4 min.

Rank	gTLD	Bid Amount	Bidder
1	**.movie**	$250,000	Hollywood Domains, Inc.
2	**.sex**	$247,500	Hustler
3	**.web**	$244,200	Image Online Design, Inc.
...	...	...	...
50	**.site**	$195,000	Afilias, Inc.
51	**.mobile**	$194,500	Nokia, Inc.
...	...	...	...
100	**.geo**	$50,001	SRI International

482. It is important that the number of gTLDs offered be substantially less than the number of bidders, so as to avoid signaling near the close of bidding. If fewer than 100 bidders qualify, we think ICANN should correspondingly lower the number of gTLDs that would be approved.

483. We expect that some participants will offer multiple gTLDs, and some gTLDs will be proposed by several bidders. The precise number of combinations cannot be known in advance.

Relative ranking in the top fifty is unimportant, as each will win the right to be added to the root. Accordingly, bids in this group are likely to be close to one another. The real battle will be waged at the boundary, between the 50th and 51st ranked bids. As the auction nears close, Nokia and Afilias will both raise their bids, trying to preemptively outflank the other, as well as bids higher up the ladder. Anyone who has lost an eBay auction can appreciate how seasoned bidders have perfected winning strategies, such as last-second stealth maneuvers. Indeed, bidding software helps those who are serious about the enterprise.[484]

This is an auction within an auction. For instance, if Hustler and Playboy both bid for .sex, only the higher of the two can succeed, even if they are both among the top fifty bids. Subjecting both gTLDs and operators to competitive bidding serves two salient purposes. First, it works as an anti-collusion mechanism. Competitors are unlikely to conspire to make low bids, since that could exclude both from the winning pool. Second, the auction identifies the fifty most valued gTLDs, not merely those who most want to operate registries. This not only maximizes revenue to ICANN, it puts the domain name space to the highest and best use, as measured by market players. To facilitate this assessment, the auction should remain open long enough (perhaps thirty days) so that participants can obtain feedback from potential customers and other constituents.

The most notable result of an auction along these lines is that the successful gTLDs are not likely to be ones that ICANN would select under existing policies and practices. Therein lies a principal purpose in preferring markets for the allocation of private goods.

C. gTLD Auctions Would Serve the Public Interest

In this section, we demonstrate that auctions of new gTLDs would serve the public interest. First, we establish that as a matter of law, ICANN has a mandate to serve the public interest.[485] Second, we argue that auctions serve the public interest in three ways:[486] by securing adequate funding for ICANN to perform its core missions,[487] by allowing ICANN to subsidize uses of the root space that are in the

484. *See, e.g.,* Auction Sentry, Auction Sniping, *Tracking and Bidding Tool* <http://www.auction-sentry.com> (accessed Feb. 18, 2003); Auction Sniper, *Are you tired of losing eBay auctions?* <http://www.auctionsniper.com> (accessed Mar. 18, 2003).

485. *See infra* pt. IV(C)(1) (ICANN's Mandate to Serve the Public Interest).

486. *See infra* pt. IV(C)(2) (gTLD Auctions Serve the Public Interest).

487. *See infra* pt. IV(C)(2) (Auction Revenue Can Address ICANN's Funding Problems).

public interest, but not supported by the market,[488] and by putting the root to its highest and best commercial uses.[489]

1. ICANN's Mandate to Serve the Public Interest

ICANN is a California Nonprofit Public Benefit Corporation.[490] To qualify as such, the corporation must have a "public or charitable purpose."[491] Public benefit corporations "are not operated for the mutual benefit of their members but for some broader good."[492] ICANN is also operated, "exclusively for charitable, educational, and scientific purposes within the meaning of § 501(c)(3) of the Internal Revenue Code."[493] Principal among "the charitable and public purposes" of ICANN are "performing and overseeing functions related to the coordination of the [DNS], including the development of policies for determining the circumstances under which new top-level domains are added to the DNS root system."[494]

In short, ICANN's TLD policies must promote a public purpose that inures to the "broader good," not unlike the FCC's mandate to promote the "public interest, convenience and necessity." This is confirmed by ICANN's MOU with the Department of Commerce, which stresses the Corporation's public trust responsibility over the TLD name space.[495] If auctions fail to serve the public interest, or transmute ICANN into a for-profit corporation,[496] they ought not to be considered in any expansion of the gTLD name space. But the public purpose of market allocation policies is well demonstrated by theory,[497] analogous FCC practice,[498] and by ICANN's own statement of purpose. Thus, in "operat[ing] for the benefit of the Internet community as a whole," the Corporation shall do so "to the extent

488. *See infra* pt. IV(C)(2) (Surplus Auction Proceeds Would Enable ICANN to Pursue Public Interest Projects Consistent with its Core Mission).

489. *See infra* pt. IV(C)(2) (Auctions Provide for Efficient Allocation of the Root Resource).

490. *See* Cal. Corp. Code § 5110, *et seq* (2003).

491. Cal. Corp. Code § 5111 (2003).

492. Cal. Corp. Code § 5110, Legislative Committee Summary (2003).

493. *See* ICANN, *Articles Of Incorporation of Internet Corporation for Assigned Names and Numbers* (As Revised) <http://www.icann.org/general/articles.htm> (November 21, 1998).

494. *Id.*

495. *See generally* Froomkin, *supra* n. 79.

496. This would occur, for example, if the proceeds were treated as proprietary and distributed to members of the corporation.

497. *See supra* pt. II (An Economic Analysis of Domain Name Policy).

498. *See supra* pt. III (Comparisons with Telecommunications Policy).

appropriate . . . through open and transparent processes that enable competition and open entry in Internet-related markets."[499]

2. gTLD Auctions Serve the Public Interest

Is our auctions proposal consistent with ICANN's obligation to serve the public interest? Opponents of auctions might argue that the auction scheme puts ICANN in the role of a profit-maximizing market participant, and hence that auctions are inconsistent with ICANN's role as a trustee for the public interest. In this section, we demonstrate that this concern is misguided. In fact, gTLD auctions would facilitate ICANN's ability to serve the public interest in a variety of ways. Indeed, we demonstrate the gTLD auctions better serve the interests of the public at large, including end users,[500] than would the alternative options available for expansion of the TLD name space.

Because auctions promote allocative efficiency, per unit operational costs for name services will decrease. In a competitive world, some or all of these savings are passed along to consumers. In the case of name service in the gTLD space, it means that marginal costs by registry operators in the form of annual fees paid to ICANN may go down or rise at a slower pace. Lower costs are likely to result even though gTLD operators will bear acquisition costs not realized currently. These up-front payments are offset by marginal cost reductions and reduced need for periodic payments from name service providers. SLDs will share in these reductions as well as from elimination of monopoly rents that gTLD operators charge due to their quasi-monopoly status in an environment of artificial scarcity.

If gTLD operators are paying ICANN at auction, should they continue to make annual contributions to ICANN's budget? Broadcast and telephony analogies are imperfect since consumption of the respective name spaces in those industries had been at zero cost prior to the advent of competitive bidding. Still, the FCC charged license application fees (analogous to ICANN's gTLD application fee) which partially funded ongoing agency operations.

499. ICANN Articles Of Incorporation, *supra*, n. 493. *See also* ICANN, *Bylaws for Internet Corporation for Assigned Names and Numbers* <http://www.icann.org/general/bylaws.htm> (Dec. 15, 2002) ("In performing its mission, the following core values should guide the decisions and actions of ICANN: . . . 5. Where feasible and appropriate, depending on market mechanisms to promote and sustain a competitive environment 6. Introducing and promoting competition in the registration of domain names where practicable and beneficial in the public interest.").

500. *See supra* n. 16 (defining end users in contrast to information providers).

Thus, ICANN could continue to charge an annual fee to registrars and registry operators, but the amounts should reflect the costs of specific oversight functions (e.g., IANA), rather than serve as a general purpose tax, as is the case now. Even with a lower fee structure, ICANN's annual revenue stream might go up, rather than down, because of the increased number of gTLD operators and registrars. The ultimate level of non-auction fees requires further economic and fiscal analysis. We simply observe that auction payments by successful gTLD bidders would not necessarily increase consumer costs; it would very likely reduce them.

Auction Revenue Can Address ICANN's Funding Problems

One obvious effect of conducting gTLD auctions would be to increase ICANN's revenues. Is this necessary or desirable? In its July 2000 report to the House and Senate Commerce Subcommittees, the General Accounting Office (GAO) noted that "funding has been a source of concern for ICANN."[501] An original proposal to levy a $1 per year licensing fee on each domain name registration was rejected by the Department of Commerce. Instead, ICANN relies on payments, some voluntary, some contractual, from various registries and registrars for its annual budget of approximately $4 million. Because many country code registries refuse to pay their share (they call it an "arbitrary tax"), "ICANN has experienced continued difficulties in securing a stable funding mechanism."[502] Even more problematic, "ICANN's current fundraising is a recipe for undermining legitimacy. It is likely to (1) subject ICANN to undesirable influences; (2) subvert its objectives by increasing its staff; and (3) render its decisions unfair and arbitrary."[503]

From an economic standpoint, the controversy over ICANN's attempt to charge ccTLD operators a fee for the provision of root service seems odd on the surface. ICANN is providing a valuable service that ccTLD operators utilize. Why would the ccTLD operators expect this service to be provided for free? Putting the

501. Ltr. from Robert P. Murphy, Gen. Counsel, GAO, to Subcomm. on Commerce, Justice, State, and the Jud.; Comm. on Appropriations, United States Sen.; Subcomm. on Commerce, Justice, State, and the Jud., and Related Agencies; Comm. on Appropriations, H. Rep. to Honorable Judd Gregg, Subcomm. on Commerce, J., State, and the Jud., *Depart. of Commerce: Relationship with the Internet Corporation for Assigned Names and Numbers* 43 <http://www.gao.gov/new.items/og00033r.pdf> (July 7, 2000).

502. *Id.* at 44.

503. Tamar Frankel, *Accountability and Oversight of the Internet Corporation for Assigned Names and Numbers, Report to the Markle Foundation* 7 (July 12, 2002) (available at <http://www.markle.org/news/ICANN_fin1_9.pdf>).

point another way, why do ccTLD operators expect that they should be allowed to be free riders, consuming a service for which others pay? Part of the answer to these obvious questions lies in the history of the DNS and root service. Root service was historically provided free of any specific charge. Because the ccTLD operators were not required to pay for root service in the past, they may have come to see free root service as an entitlement. Moreover, each ccTLD is organized autonomously. Some ccTLD operators provide name service within their domain free of charge.[504] For such operators, the imposition of a fee for root service may pose a substantial challenge. The subsidy to the ccTLD operator may be insufficient to cover the charge for root service, and it may not be politically feasible to cover this charge by either charging for name service within the ccTLD's domain or by obtaining public or private subsidies. Hence, it is quite natural for ccTLD operators to strongly oppose the imposition of a fee for root service.

In a first-best world, ccTLD operators should bear the cost of root service and pass that cost on to registrants within the ccTLD. This solution is first best, because it prevents the inefficient use of root service. But the first best solution may well be unavailable—"outside the feasible choice set," in economic parlance. ICANN's bottom-up, consensus-driven process has so far proven resistant to the effective collection of a root service charge from the ccTLD operators. Hence, there is good reason to consider second-best solutions. One possibility is to utilize revenues from a gTLD auction to subsidize the provision of root service to the ccTLDs. In this essay, we do not address the legitimacy or desirability of ICANN's charging a fee to the ccTLD operators for the provision of root service. Our point is a modest one: auction revenues do not have the practical problems associated with charging the ccTLDs for root service.

A stable and unified root is in the public interest. For historical reasons, ICANN provides the best currently-available institutional home for the maintenance and management of a stable root. It follows that it is in the public interest for ICANN to have an adequate source of funding, and gTLD auctions provide a very attractive, politically feasible means by which ICANN can obtain necessary funding.

We recognize that ICANN has critics. Some of these critics may oppose gTLD auctions on the ground that fiscal instability may be a

504. *See* DomainConquest.com, *Registration Overview* <http://www.domainconquest.com/register/overview.htm> (accessed Dec. 17, 2003).

likely route to ICANN's economic demise. It is possible that populist rhetoric aimed at the "ICANN tax" is motivated by opposition to ICANN itself. These topics are outside the scope of this paper. We believe that if ICANN is replaced, the replacement entity will be in a better position to make DNS policy if ICANN commits to (or carries out) an auction experiment. We also note that it is far from clear that a replacement entity would be better positioned to replace the "beauty contest" model with auctions.

Surplus Auction Proceeds Would Enable ICANN to Pursue Public Interest Projects Consistent with its Core Mission

What if gTLD auctions were to yield revenues that exceeded ICANN's budgetary requirements? We take no position on the question whether this is likely to happen. On the one hand, it is difficult or impossible to estimate the revenues that would result from a gTLD auction. Presumably, those revenues would be invested in an endowment fund that would yield income for ICANN's operational budget.[505] On the other hand, ICANN's current budget does not provide a clear picture of ICANN's true financial need. For example, the root system is currently subsidized by various root server operators. If ICANN were adequately funded, it might be appropriate for ICANN to pay fair market value for root server operation. Moreover, ICANN's current staffing plan is arguably inadequate. For example, ICANN does not have a professional economist on staff—a dangerous condition for an entity responsible for making economic decisions with potentially enormous consequences.[506] Moreover, ICANN lacks funding to conduct substantial outreach programs that would enable end users[507] to participate meaningfully in the ICANN policy formulation process.

Because both revenues and expenditures are difficult to estimate, the notion of an auction revenue surplus is hypothetical. However, were such a surplus to materialize, ICANN would have ample

505. We assume that bidders in a gTLD auction would be required to submit lump-sum, as opposed to periodic payment bids. We also assume that a fixed number of gTLDs would be auctioned, and that auctions would, at least initially, be relatively infrequent. We also assume that the value of new gTLDs could decline over time, as alternatives to the DNS emerge and as the baseline number of gTLDs grows. Thus, it would be prudent for the ICANN board to treat the proceeds of the initial gTLD auction as a capital endowment, as opposed to annual income.

506. By way of comparison, the FCC has traditionally employed a sizable professional staff of analysts, headed by a nationally renown economist. The agency's current chief economist is Simon Wilkie, Professor of Economics at California Institute of Technology.

507. *See supra* n. 16 (defining end users in contrast to information providers).

opportunities to utilize the surplus in ways that are consistent with ICANN's core mission and that would serve the public interest. The obvious comparison here is to the telecommunications industry's universal service and e-rate funds. These support a number of consumer subsidies, from "plain old telephone service" (POTS) to high speed broadband access by schools, libraries and rural health care providers. They are in partial fulfillment of Congress' mandate to promote "deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans."[508] Approximately $4 billion are made available annually through the e-rate fund alone for a variety of public interest programs. Although ICANN's surplus revenues are likely to be far less, templates exist for use of such funds in the public interest.

Public interest organizations have already explored options for subsidizing public interest uses of the root. For example, .Kids, one of the pending applicants for a new gTLD has proposed auctioning off "glamour" SLDs and using the proceeds to fund charitable activities on and off the Internet.[509] The Benton Foundation proposed to the Department of Commerce that the .us ccTLD be restructured with SLDs auctioned off with proceeds funding various public interest programs. Their goal was to narrow the "digital divide" by "promot[ing] access by all Americans to communications services."[510]

We do not advocate these particular proposals.[511] We urge ICANN to act cautiously, limiting its public-interest projects to those which have a strong connection with ICANN's core functions. For example, one serious problem with the DNS is that the system currently is limited to domain names that utilize the standard Roman alphabet and Arabic numerals. This obviously creates barriers of access to Internet users who are literate only in languages that use other alphabets or ideograms. ICANN has already initiated a project for the development of Internationalized Domain Names (IDN).[512]

508. 47 U.S.C. § 157 (2003).

509. *See* .Kids Domains, Inc., *Description of TLD Policies* <http://www.icann.org/tlds/kids4/policies> (accessed October 31, 2003). The .Kids registry would have been operated for free by ICM Registry, Inc., another rejected applicant.

510. Benton Foundation Media Access Project, *Comments of the Benton Foundation and the Media Access Project* <http://www.ntia.doc.gov/ntiahome/domainname/usrfc2/comments.html> (Oct. 6, 2000).

511. Nor are we opposed to them on their merits. We believe that worthy "digital divide" programs should be pursued by government agencies and non-governmental organizations.

512. *See* ICANN, *Internationalized Domain Names (IDN) Committee* <http://www.icann.org/committees/idn/> (accessed April 8, 2003).

Surplus auction funds could be used to accelerate this process and extend IDN beyond the major international languages, such as Mandarin Chinese, Japanese, and modern Arabic, to smaller language groups that would benefit from native language domain name service. Perhaps, in addition to consulting economists on domain name policies, ICANN should also consult linguists, social anthropologists and others with relevant expertise, regarding the impact of the DNS on Internet usage by those whose written language does not employ the Roman alphabet / Arabic numeral character set.

With surplus auction revenue, ICANN could fund other programs that overcome the global digital divide. Among these are grant funds for gTLDs in Less Developed Countries (LDCs), or targeted at outreach to Internet users in LDCs. Overcoming the digital divide, especially in LDCs, is a long-term goal consistent with ICANN's mandate to operate in the public interest. Many programs towards this goal, such as the current IDN project, can be adopted and implement by ICANN on its own initiative. However, ICANN should work with other international groups, including Non-Governmental Organizations (NGOs), to develop other programs. While many such programs can and will operate independent of ICANN, only ICANN can approve new gTLDs or create a mechanism to do so. In short, ICANN could make tremendous headway in coordinated efforts to overcome the digital divide, if only it had the revenue to do so.[513]

Auctions Provide for Efficient Allocation of the Root Resource

There is yet another and more fundamental reason why gTLD auctions serve the public interest. Auctions put the root to its highest and best use. It is a fundamental assumption of current ICANN policy that the root space is a scarce resource. Why is the root "scarce" in the economic sense? There are two reasons. First, we assume that the Domain Name System cannot feasibly support an unlimited number of TLDs. We neither endorse nor oppose this assumption. It rests on historical experience with the root and technical judgments best made by experts. Second, and more fundamentally, the root is a scarce resource, because for any given unique string of characters that could function as a gTLD name, there can only be one authoritative system of name servers for that string. In other words, there can only be one

513. *See Equity Enhancing gTLD Auctions* <http://gtld-auctions.net/eeauctions.html> (accessed April 8, 2003); Mueller & McKnight, *supra* n. 450, at 21-22.

.com, one .net, one .biz, and so forth. Either of the two reasons would independently establish that the root is scarce in the economists' sense of that concept.

Given that the root is a scarce economic resource, the question becomes: how can the root be put to its highest and best use? At this point, we have already established the foundations for an answer to this question. We have established that, as a matter of economic theory, the DNS is a private good, although it is also a public resource. The analogous cases of the broadcast spectrum and the telephone number space provide a wealth of experience for determining whether theory conforms to practice. In both arenas, a similar lesson has been learned. Well-designed auctions can put public resources to their highest and best use.

At this stage, we complete our argument. We shall demonstrate that gTLD auctions will lead to the most efficient use of the root resource. Our argument will proceed in three stages. In the discussion that immediately follows, we show how an auction combined with a secondary market in gTLDs leads to an efficient allocation of the root resource—in the abstract as a matter of economic theory. We then proceed in the section that follows to reinforce this demonstration by comparing gTLD auctions to four alternative policies: a static root, a taxonomy plan, case-by-case public interest evaluation, and a rule of first occupation.[514] Although gTLD auctions have advantages of each of these four alternatives, the alternatives themselves are not equal. First occupation is the best of the alternatives, case-by-case evaluation is next best, a taxonomy plan is the third best option, and a static root is the worst of all. In the final section of this part, we attempt to anticipate and answer objections to auctions as a means to allocate new gTLDs.

Why are gTLD auctions efficient? No doubt some readers will think this question answers itself. An auction creates a market for gTLDs. For any given gTLD name, the bidder that can put the string to the highest and best use will make the highest bid for the string. If the number of new gTLDs is limited, then an auction provides a mechanism by which those gTLDs that produce the greatest value will be created; the most valuable gTLD strings will receive the highest bids. Since the Internet is an economic engine of unparallel strength, "highest and best use" gTLDs means further economic growth. "Billions of dollars of cumulative loss to the U.S. economy

514. *See infra* pt. IV(D) (gTLD Auctions Have Comparative Advantages over the Feasible Alternatives).

have been attributed to inefficient spectrum allocations under the [pre-auction] system."[515] It is impossible to know whether the current regime of gTLD deployment has been as damaging. Still, one cannot gainsay that more efficient allocation in the gTLD name space will have a positive effect on the economy and provide services of value to end users of the Internet.

However, many readers may raise an objection at this point. What about valuable gTLDs that are not associated with profit-making enterprises? For example, in a gTLD auction, it is likely that .museum would not have been created. Isn't it possible that the .museum domain will create more good than some alternatives with greater market value, for example .sex, .ibm, or .biz? This is a complex issue,[516] but it does not need to be resolved. If there are high social value, low market-value gTLDs, an auction scheme will do a better job of creating and supporting them.

How can that be so? We have already seen the answer in our discussion above.[517] If there is a need to subsidize public-interest gTLDs, then the best way to accomplish that goal is to provide ICANN with adequate resources. The proceeds of gTLD auctions can be utilized to subsidize public-interest gTLDs, and if necessary, to expand the capacity of the root to make the DNS capable of supporting the additional gTLDs. If ICANN should subsidize some uses of the root, then ICANN needs the resources that will enable it to do so.

Finally, the experience of the FCC in the United States and of regulators in a variety of other nations suggests that auction design is important. A badly designed auction can facilitate the cartelization of

515. Evan Kwerel & John Williams, *A Proposal for a Rapid Transition to Market Allocation of Spectrum* 1 (FCC Office of Plans and Policy 2002).

516. From an economic perspective, the question is whether there are public-good gTLDs. That is, are there gTLDs that cannot be provided by the market? This question is complicated in part by the availability of second level domains for public-good associated hosts. In the gTLD space, the .org domain provides a home for many nonprofits; the .gov domain provides a home for government entities. In the ccTLD space, third level domains serve the same function. Even if there are gTLDs that are associated with the provision of public goods, it isn't clear that the gTLDs themselves should be considered public goods. Provision of public goods requires a variety of scarce resources. Governments, for example, need to purchase gasoline, electricity, paper, and personal computers. No one is much inclined to argue, however, that gasoline should be provided to the government for free or that suppliers should be required by law to sell gasoline to the government at below cost, making up the difference (in the form of a hidden tax) by charging more to other consumers. For the sake of argument, however, we assume that public-good gTLDs may exist.

517. *See supra* pt. IV(C)(2) (gTLD Auctions Serve the Public Interest).

bidders—leading to lower auction prices. Auction structure might itself result in inefficient uses of the name space. For this reason, we urge ICANN to seek input from outside the ICANN community when designing the gTLD auction. Telcos are players in spectrum auctions for wireless phone bandwidth, and they also play an important role as both backbone operators and ISPs. But it goes without saying that the telcos should not be permitted to dominate the auction design process. ICANN's board must seek independent advice about auction design to be faithful to its statutory mandate to act in the public interest.

D. gTLD Auctions Have Comparative Advantages Over the Feasible Alternatives

Fundamentally, gTLD auctions are a good idea, because they put a scarce resource, the root, to its highest and best use. Our argument thus far, however, is incomplete, because we have yet to consider the alternatives to auctions. No doubt the human imagination can devise an almost infinite number of conceivable policies for allocating the root space. Here we consider five options that we believe are within the feasible choice set and are at least somewhat likely to be on the agenda for consideration by ICANN.

1. A Static Root

The first option is a static root. It is likely that within the ICANN process, there will be some advocates for a static root. For example, Verisign derives an economic rent from its position as the quasi-monopolist registry for the .com domain and as the legacy registrar for many of the second level domains in .com, .org, and .net. We do not pretend to know whether the expansion of the gTLD name space will have a significant impact on Verisign's rents, but there are good theoretical reasons to suspect this might be the case. New gTLDs can compete with Verisign in the provision of registry service, and competition will tend to drive prices down to the level of costs (including, of course, the cost of capital). Proprietors of other gTLDs, for example, the .biz, .info, and .name gTLDs may be in a similar economic position. To take one example, the proprietors of .name may fear that a .nom domain would be a potential competitor for the registration of individual names as second level domains.

But these advocates for a static root do not represent the public interest. They are rent seekers; that is, they seek to charge prices higher than those that they could charge in a competitive market. Those rents come at the expense of information providers and end

users. Such rents lack economic justification. They are naked wealth transfers to the firms that receive them.

But a static root does more than simply benefit some existing stakeholders at the public's expense; it also precludes innovative uses of the gTLD space that could produce substantial benefits. We do not pretend to know what these uses are. Some of the possible uses are contained in the various proposals that were submitted to ICANN in the last round of gTLD proposals. Undoubtedly, others would emerge in a gTLD auction. We do know that private firms that submit gTLD bids will not make the bids, unless they believe that they can make a profit on the operation of the new gTLD.

2. The Taxonomy Alternative

A second alternative is for ICANN to expand the root by adopting a taxonomy. By taxonomy, we mean a structured set of names. The current root was intended to be taxonomized. The ccTLDs are semantically significant designators for geographical regions, nations and their territories. The gTLDs were intended to designate various categories of information providers.[518] Thus, .com was for commercial enterprises, .org was for nonprofit enterprises, .net for internet related information providers, and so forth.[519] This same concept could be extended to add additional categories. These categories might be laid out by ICANN or by some other body charged by ICANN with the task of expanding the taxonomy. For ease of reference, we shall refer to whatever body would produce the taxonomy as the "taxonomy committee."

Auctions would be superior to an expanded taxonomy for reasons that we have already made clear in our discussion of a static root. The taxonomy approach does not permit the market to operate in the allocation of the root resource. If the gTLDs that would be proposed by the taxonomy committee are the highest and best use of the root, then private firms will have an incentive to bid and win the right to provide gTLD names that would be included in the taxonomy. It seems more likely, however, that a gTLD auction can do a superior job of identifying those gTLD names that would put the root to its highest and best use. There are several reasons for this conclusion:

518. *See supra* n. 16 (defining information providers by way of contrast with end users).

519. *See supra* pt. I(C)(2) (The Generic TLDs).

- Auctions bring the resources of many firms into the identification process. Each firm that bids will expend resources and deploy personnel in the process of deciding on a maximum bid price. A taxonomy committee, however, would consist of a small number of individuals, likely volunteers, likely without a substantial staff, who would work part-time on the project of developing the taxonomy.
- Auctions bring the profit motive to bear. Whereas a taxonomy committee has no profit incentive to identify the highest and best uses for the root, firms bidding in a gTLD auction would have such incentives.
- Adoption of the taxonomy approach is itself a decision about the highest and best uses of the root, but this decision would be made on the basis of limited information. If ICANN did decide to expand the root by creating an expanded taxonomy, that decision would be made by the bottom-up, consensus driven ICANN process. But that process is not well suited as a method for determining the highest and best uses of the root. Participants in the ICANN process are, for the most part, technical specialists, and not entrepreneurs. Moreover, some participants in the process have economic incentives to resist expansion of the root.
- The name space is not the only method of access to the Internet. Guessable domain names are supplemented by search engines and other means of access. A thoroughly organized taxonomy would simply be yet another hierarchically organized outline of links to IP Addresses. But we do not need to taxonomize the root in order to add Yet Another Hierarchically Organized Outline to those that already exist. Such taxonomized schemes of Internet access are provided by YAHOO, Google, Lycos, and dozens of other services.

Advocates of the taxonomy approach might argue that a taxonomy has the advantage of "guessability," e.g., that a top-down taxonomy will allow Internet end users[520] to know intuitively which gTLD to query for a desired host service. The argument might have prevailed in the early days of the Internet, before the advent of comprehensive search engines. Moreover, the taxonomy paradigm has already been violated by the opening of restricted TLDs (such as .org, .net, and even ccTLDs such as .tv and .us) to general commercial

520. *See supra* n. 16 (defining end user in contrast to information provider).

use. But given the existing Internet, guessability does not prove that a taxonomy is better than auctions:

- Guessability is doomed to failure, because the DNS is not uniformly taxonomized at the level of SLDs. A truly taxonomized root might have .com as a gTLD, .car as a SLD, .fordmotorcompany as a third level domain, and so on. The guessability argument fails, first and foremost, because second and third level domains are not taxonomized.
- Taxonomy can be provided by auctions in a variety of ways. For example, one proposal for the root might be for a gTLD that is designed for guessability. Thus, chevron.petroleum.guess, chevron.oil.guess, chevron.servicestation.guess and chevron.gasoline.guess might all be sold by the proprietors of the .guess domain as a package to Chevron. If guessability has market value, we can expect that some portion of the root will be used for guessable domain names.

"Taxonomy" may be new jargon, but beneath the surface the idea that the root should be taxonomized is simply another name for ad-hoc public-interest decisionmaking by ICANN. Before the ICANN board moves to a taxonomy approach, it should reflect seriously on the lessons of history. Nothing about the FCC's experience with command-and-control public-interest decision making suggests that a taxonomy committee would succeed. Rather, the lesson of history is that auctions would outperform a taxonomy committee—if the goal is to put the root to its highest and best use.

3. Case-by-Case Public Interest Evaluations by ICANN

A case-by-case approach to domain name expansion is, of course, the equivalent of the "beauty contest" approach now abandoned by the FCC. We have already examined the difficulties that the FCC encountered. There is simply no reason to believe that the ICANN board, with volunteer members and a very thin support staff, can do a better job at case-by-case evaluation than the FCC (with a large staff and budget in the hundreds of millions of dollars) was able to do. Indeed, ICANN's single experience with root expansion using this approach was, by most accounts, a failure of process.[521] More fundamentally, the ultimate economic value of various creative uses of the root is difficult to predict in advance. Entrepreneurial firms are in a far better position to value their proposals for new gTLDs than is ICANN. Such firms possess more

521. *See supra* pt. IV(A)(1) (ICANN and gTLD Expansion).

information than ICANN about their own proposals, and have better internal resources for evaluating the profit potential of their resources.

In addition, profit-maximizing firms have strong incentives to maximize the accuracy of their bids. If their bid exceeds the difference between revenue generated by the gTLD minus the non-auction costs, then the firm will lose money. If the bid equals that difference, then the firm will fail to realize profits. By way of contrast, ICANN lacks such incentives. ICANN is a nonprofit corporation, and ICANN's staff, management and board do not have strong incentives to approve the most profitable gTLD proposals or to deny gTLD proposals which do not rank high in terms of profitability. Even if ICANN's staff, management, and board make a good faith effort to select new gTLDs in the public interest, they simply lack the knowledge and resources to do the job as well as auctions can do it. Indeed, we think the effects of such efforts are pernicious. Rather than assure that licenses or gTLDs are put to the most beneficial uses, they tend to defeat innovation and homogenize the respective services. In other words, ICANN, with its public interest mandate, must necessarily be risk-averse to innovation. Moreover, a wrong guess by a commercial entity, with losses borne by investors, is preferable to a wrong guess by a regulator, with losses borne by the entire Internet community.

4. A Rule of First Occupation

First occupation has history on its side as an allocation model for the distribution of natural resources. It has been used for real property, water, minerals, as well as the radio spectrum in pre-regulatory days. Supporters argue that first occupation promotes discovery and hard work. The early bird gets the worm. Unfortunately, the traditional conception applies poorly to intangible rights where vast numbers of claims (e.g., domain names) can be filed with little effort. In practice, a rule of first occupation has led to cybersquatting because the investment required to stake a claim is so low. As with tangible property, counter-rules are necessary to assure that first occupation does not lead to waste. Thus, common law doctrines of adverse possession, usufructuary use, and active working of claims have been adapted to prevent squatting on first occupation rights.

Given zero transaction costs, the Coase theorem predicts that the choice of allocation method (e.g., a rule of first occupation versus an auction) has no impact on who ultimately emerges as the right holder.

In the case of gTLD sponsors and operators, first occupiers can be expected to monetize their rights by transferring control over their registries to firms that will put them to higher and better uses. Of course, they are likely to reap a windfall, as is the case with SLDs now. Auctions capture that windfall and transfer it where it can do the most good. The windfall can be suppressed by using non-market allocation schemes and erecting barriers to transfer. That describes the current regime, which might also be described as a deliberate decision to waste the root resource. It has little to commend itself.

5. Lotteries

The last of the options ICANN is likely to consider is random assignment of gTLD slots. Three influential advocates of domain name reform have proposed the use of lotteries, at least in part, as a way to allocate an expanded name space. In their white paper on "The post-.COM Internet,"[522] Milton Mueller and Lee McKnight propose a combined auction/lottery system. Commercial gTLDs would be awarded by auction, while non-commercial gTLDs and those from Less-Developed Countries (LDCs) would be awarded by random selection.[523] Karl Auerbach, the former elected ICANN board member for North America, prefers a lottery for all new gTLD slots.[524] He argues that lotteries best promote the non-economic social value of distributional fairness, a goal also reflected in the Mueller/McKnight proposal.

There may be cases in which auctions would create distributional problems, but we are concerned about the use of lotteries to achieve fairness and efficiency, at least as the principal means for allocating new gTLDs. First, lotteries may be foreclosed by law, as in California, where ICANN is located.[525] Second, lotteries produce none of the revenue that ICANN needs to operate and advance other public interest goals. Third, and most importantly, lotteries are economically inefficient. For commercial gTLDs, lottery winners would serve only as temporary conduits for new gTLDs as they worked their way through the transfer process (and transaction costs) to operators who more highly valued the slots. As common sense and experience indicate, lottery winners often resell their rights on the open market,

522. Mueller & McKnight, *supra* n. 450.

523. *Id.* at 21.

524. *See* Karl Auerbach, *Why Lotteries Are Better Than Auctions When Distributing New TLD Slots* <http://www.cavebear.com/cbblog-archives/000016.html> (accessed Apr. 17, 2003).

525. *See supra* n. 439.

capitalizing for themselves the revenue otherwise produced by auction.[526] In fact, lotteries *are* auctions, only removed one level down from initial assignment.

It is possible to avoid the windfall gains that lotteries would confer on the winners of new gTLD strings by making new gTLDs inalienable. This would have the effect of reducing the windfall gains produced by lotteries, but it would create another, and more serious problem. Nontransferable gTLDs will not be transferred by the market to their highest paying and best users. The result may be tremendous inefficiencies—as inefficient gTLD managers are locked into the role by the transfer restrictions. Of course, such restrictions may be circumventable. For example, rather than transfer the gTLD, the corporate shell can be transferred. ICANN is in a poor position to assess the economic realities underlying transfers of corporate ownership. To the extent that ICANN does not police such transactions, a secondary market for gTLDs will emerge, but it will have the undesirable characteristic of high transaction costs. To the extent that ICANN does police such transfers, the effect will be to divert ICANN's resources into a nonproductive task.

Despite these concerns, a lottery restricted to noncommercial and LCD TLDs, as Mueller and McKnight have proposed, is worth exploring further. For instance, although commercial broadcast licenses are allocated by auction, noncommercial licenses (e.g., public radio) are assigned free of charge.[527] There may be other options that could be examined as well. For example, ICANN might create transferable bidding credits for LCDs and public interest entities,[528] which in turn could allocate them to proposed new gTLD projects on the basis of an open competition.[529] In sum, lotteries, bidding credits, and other options should be explored as part of the comprehensive design phase of any auction plan.

526. *See supra* n. 339 and accompanying text.

527. These free licenses come with strings attached – restrictions on commercial speech. *See* 47 U.S.C. § 399(b) (2000); *Nat'l. Pub. Radio v. FCC*, 254 F.3d 226 (D.C. Cir. 2001).

528. The FCC provides bidding credits to small businesses. *See* 47 U.S.C. § 309(j)(4)(D) (2003).

529. A similar mechanism has been proposed for spectrum auctions. *See* Ellen P. Goodman, *Bargains in the Information Marketplace: The Use of Government Subsidies to Regulate New Media*, 12 J. of High Tech. and Info. L. 217, 232 n. 43 (Nov. 25, 2002) <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=366020>.

E. Objections to Auctions

Arguments against expansion of the name space by auction fall into two general categories. One set of arguments is propounded by existing stakeholders, i.e., those whose economic self-interests lie in maintaining a relatively static root.[530] A debate with them would not be about rational domain name policy, but about vested rights, entitlements and the status quo. We think this article as a whole responds to those arguments; we need not engage them further at this point. But a second set of objections is made on the grounds of economic and public policy, often by well-respected ICANN observers and critics. To the extent we have not fully responded to these points elsewhere, it is prudent that we do so now.[531]

1. Why Exclusive Rights?

Hardly anyone believes the root should remain fixed at its current size. In the campaign for the first and only ICANN election, many candidate platforms included a position favoring gTLD expansion.[532] Since that time, the debates have been mostly about the pace of expansion and methodology. Views on these issues turn on one's understanding of engineering and economic principles. With respect to the former, there is a general consensus that hundreds or thousands of new gTLDs can be added to the root without jeopardizing its stability, but that its capacity is not unlimited. Accepting this, the issue next turns to economics and social welfare. Should the name space be regulated at all; if so, by whom; if by ICANN, how; and if by exclusive licensing, how should rights be allocated? This article concerns only the last point; we have assumed an affirmative answer to the first three. But before considering specific objections to gTLD auctions, we step back a moment to ask again whether the name space should be regulated and subject to exclusive licensing in the first place. If not, none of the allocation

530. Some potential entrants may have similar interests, either because they feel better served by the existing process than the market, or are confident they too will soon be stakeholders, and want to reap the benefits of incumbency.

531. In addition to the arguments discussed below, we will discuss one additional argument in this footnote. It might be argued that an open gTLD auction would be problematic because obscene or offensive gTLDs might be established, causing both offense and possible political backlash. This problem exists in other arenas—for example, license plates. The conventional solution is to establish a list of forbidden strings. We assume that a similar solution would be devised for gTLD auctions.

532. *See, e.g.*, ICANN, *ICANN candidate statements of Johannes Kuo-huie Chiang, Winfried Schueller, Lawrence Lessig, and Emerson Tiller* <http://www.members.icann.org/nominees.html> (accessed Dec. 7, 2003).

methods we have discussed need be entertained; domain names anywhere on the hierarchy could simply be used as needed.

As surprising as this might sound to anyone familiar with the domain name system, it is emerging as the principal battle ground in spectrum licensing. Rather than quibble over auctions, beauty contests and such, why not simply open the spectrum up on an as-needed basis, creating a "commons" instead of property rights?[533] Advances in radio technology have made this debate possible as interference problems can now be mediated without human intervention. Isn't the same true of the Internet? Why "*assigned* names and numbers"? Why ICANN?

The engineering answer is simple. Unlike frequencies, domain names cannot be shared or multiplexed. We can envision a telephone network that uses shared or "party lines," but not an Internet name and number system that does so. Unless every device and packet on the Internet has a unique address identifier, the system fails. Still, isn't the number of possible DNS addresses so vast as to render licensing exclusivity wholly unnecessary? This once again raises the question of proprietary rights in a public resource. As George Gilder said in the context of spectrum auctions, "you can no more lease electromagnetic waves than you can lease ocean waves."[534] A similar observation could be made of alphanumeric strings that constitute domain names. As a statement of physics, Gilder is undoubtedly correct. But physical and economic principles do not track here. Ocean waves are not scarce private goods; they have no differentiated value. Domain names do. It makes little difference if I catch this wave or the next when surfing the ocean. But it makes a huge difference which domain name I surf to on the Internet. Because of that, and because of the limited capacity of the root, assignment of domain names (and numbers) is unavoidable. ICANN exists.

2. Public Interest gTLDs

We next turn to two specific objections to auctions as means for allocating scarce gTLD resources. One, as we have seen,[535] is that public interest uses and economically disadvantaged commercial users (typically from LCDs) are unable to successfully compete in auctions. In other words, they cannot afford the private good (domain

533. *See supra* n. 369 and accompanying text.

534. *See* Noam, *supra* n. 345, at 769 (quoting George Gilder, *Auctioning the Airways*, Forbes, April 11, 1994).

535. *See supra* pt. IV(D)(5) (Lotteries).

name) when sold at market price. Yet, social welfare policies demand that these uses be encouraged; therefore, acquisition should be subsidized in appropriate cases.

There are strong arguments for this position, but they neither augur against gTLD expansion, nor undercut the basic rationale for market pricing of new gTLDs. Instead, they make a case either for beneficial use of surplus auction revenues or some adjustment to the auction framework. The latter can take the form of bidding credits, set-asides, or other non-market mechanisms, so long as they are carefully policed so as not to be subverted.

There are costs associated with assigning gTLDs for free or below market price. Opportunity cost is one, as someone must subsidize these uses. Recall that root service is not free. Another is accountability. The Telecommunications Act of 1996 requires that all telephony subsidies be transparent, rather than embedded in an integrated price structure.[536] That is why telephone bills have all those separate line-item charges for Universal Service and similar programs.[537] An open economy demands that consumers know what they're paying for and who they are subsidizing. Hidden and cross-subsidies are abundant on the Internet. Many are salutary; indeed ICANN could not currently operate without them. But, we are all better served by disclosure. One of the biggest problems with the current method of gTLD allocation is that it encourages both rent-seeking and subsidization. Auctions cure those problems. Where subsidies ought to continue, they are made more legitimate by specific, targeted and transparent programs.

The Bell System (now AT&T) maintained its monopoly for nearly a century by convincing regulators that competition and interconnection would destroy the quality of service and undercut its ability to provide service at affordable rates.[538] Broadcasters made similar arguments against band expansion and new technologies, such as low-power FM radio.[539] In each case, incumbents pretended to speak for the public interest. We now know those claims were mostly false and simply the successful tactics of monopolists. Yet, similar arguments have prevailed when it comes to the domain name system.

536. *See generally* Robert W. Crandall and Leonard Waverman, *Who Pays for Universal Service? When Telephone Subsidies Become Transparent* (Brookings Inst. 2000).

537. *See* 47 U.S.C. § 254 (2003) (Universal Service).

538. *See generally* M. L. Mueller, Jr., *Universal Service: Competition, Interconnection, and Monopoly in the Making of the American Telephone System* (MIT Press and AEI Press 1997).

539. *See supra* n. 224.

In the end, the most important answer to the public interest objection is that it assumes a false dichotomy. Unless one believes that all of the unused capacity of the root should be devoted to subsidized public-interest TLDs, the question arises as to how to allocate the resource available to competing commercial users. Auctions are the best way to do that. Auctions also generate revenues that can be used to subsidize public interest TLDs, if such subsidies are necessary.

3. Cybersquatting and Defensive Registrations

The final objection to root expansion is that it will create a negative externality—a harm to the interests of the owners of intellectual property in trademarks. If a new commercial gTLD is created, the argument goes, then cybersquatters will occupy the new name space unless trademark owners engage in defensive registrations to protect their intellectual property. Such defensive registrations are a dead weight loss—because the trademark owners are unlikely to have a real economic use for the SLDs associated with their mark in the new gTLD. For example, IBM does not have a real economic use for ibm.biz, once it already has ibm.com.

This is a real objection and not a mere makeweight, but, as we shall demonstrate, once the objection is thoroughly analyzed, it actually provides additional reasons in favor of root expansion.

First, the cybersquatting/defensive-registration objection at best provides a cost to be weighed against the benefits of root expansion. The creation of the .com gTLD resulted in cybersquatting and defensive registrations, but no one would seriously argue that these costs outweighed the benefits of creating a space for commercial SLDs. Thus, in order for the objection to succeed, it must be shown that the costs of cybersquatting outweigh the benefits of root expansion. So far as we know, no one has even attempted to make such a demonstration.

Second, the objection is less compelling now than it was at the time that the .com gTLD was created. This is because the legal position of trademark name owners is much stronger now than it was then. First, ICANN has adopted its UDRP, which provides trademark owners a relatively inexpensive mechanism for reclaiming SLDs from cybersquatters.[540] Second, the United States Congress has enacted the

540. *See* ICANN, *Uniform Domain-Name Dispute-Resolution Policy* <http://www.icann.org/udrp/> (Feb. 5, 2002); *see also* Graeme Dinwoodie & Laurence

Anticybersquatting Consumer Protection Act, which provides a comprehensive set of remedies, including *in rem* actions to reclaim domain names that are the same or substantially the same as trademarks.[541]

Third, the economics of cybersquatting would be fundamentally altered in a world with multiple, competing commercial gTLDs. The value of domain names in .com has been, in large part, a function of scarcity. Because .com was the first commercial gTLD, it was very important for the owners of famous marks to acquire the rights to the SLD in .com that would be most "guessable." Thus, IBM would want ibm.com, ATT would want att.com, Sony would want sony.com, and so forth. In a world with multiple, competing commercial gTLDs, the value of the corresponding SLD is lower because the artificial scarcity in the name space has been removed. Once ATT has att.com, it is not clear that ATT will be willing to pay very much for att.biz or att.corp.

Fourth, the opening of the gTLD space to an open auction process would actually enable the owners of famous marks to definitively establish a domain name that is unambiguously associated with their trademark. Thus, ATT can establish .att as a proprietary TLD that is unambiguously associated with the company and its products and services. Given this option, it is not clear that the owners of internationally famous and valuable marks would have any reason to pay cybersquatters anything for SLDs.

Fifth, once there are multiple competing commercial gTLDs, the economic harm associated with the registration of an SLD that is similar to a trademark is likely to diminish considerably. When .com was *it*, a firm that did not own the SLD that corresponded to its trademark followed by .com was at a serious economic disadvantage. But in a world where there are multiple commercial gTLDs, it is not clear that an SLD that is associated with the trademark is any more harmful than any other use of a communications medium that might constitute trademark infringement or dilution. It is absolutely true that every time a new communications medium is introduced, it opens up new opportunities for trademark infringing or diluting communications, but it does not follow that new media should be restricted for this reason. Likewise, it is currently possible to infringe a trademark by creating a 3LD that is the same or substantially the

Helfer, *Designing Non-National Systems: The Case of the Uniform Domain Name Dispute Resolution Policy*, 43 Wm. & Mary L. Rev. 141, 152-53 (Oct. 2001).

541. *See* Gregory B. Blasbalg, *Masters of their Domains: Trademark Holders Now Have New Ways to Control their Marks in Cyberspace*, 5 Roger Williams U. L. Rev. 563 (2000).

same as a trademark. But this possibility does not worry trademark owners, and no one has argued that 3LDs should be restricted or that a UDRP should be adopted for 3LDs. ATT and IBM are simply not worried about the possibility that the owner of the gTLD-auctions.net SLD will create an att.gTLD-auctions.net or ibm.gTLD-auctions.net 3LD.

The burden of persuasion is on trademark stakeholders to demonstrate that root expansion would create external costs to them that outweighs the benefits of gTLD auctions. The arguments adduced here suggest that they will be unable to meet this burden.

V. Conclusion: The Path to Rational Domain Name Policy

"Ontogeny recapitulates phylogeny." This popular law of biogenics[542] holds that the embryonic development of an individual organism replicates the evolutionary stages of its species development. The biogenic law can also be found in technology policy.[543] Each telecommunications industry, it seems, follows the same evolutionary path from monopoly to competition.[544] As applied to the Internet, the law suggests that ICANN will go through the same stages of allocation policy that other telecommunications industries "evolved" through. In many ways, we are still early in that process.

When auctions were first proposed to the FCC, they were dismissed out of hand as "too academic" and ridiculed as "of the realm in which it is merely the fashion of economists to amuse themselves."[545] The same attitude can be found in many of the objections to gTLD auctions espoused by defenders of the status quo. Just as, over time, auctions have become accepted as means for allocating economically scarce spectrum and telephony resources, we believe they will become seen as the best means for expanding the TLD name space. Indeed, the case for auctioning new gTLDs is compelling. In this Part, we explore the process by which gTLD

542. It is known as the "biogenic law," proposed by Ernst Haeckel in 1866. *See* University of California - Berkeley, *Ernst Haeckel (1834-1919)* <http://www.ucmp.berkeley.edu/history/haeckel.html> (accessed Dec. 17, 2003).

543. *See, e.g.*, Kenneth E. Rinaldo, *Technology Recapitulates Phylogeny: Artificial Life Art* <http://www.artnode.dk/contri/rinaldo/index.html> (June 2002).

544. The law also seems to apply to specific technological devices, such as the tendency of individual hardware and software applications to be backward compatible with legacy versions (pulse dialing and DOS are good examples).

545. *See* Noam, *supra* n. 345, at 768.

auctions might be adopted by ICANN[546] or by some other agent or process.[547] We end with a review of our major themes.[548]

A. Auctions and the ICANN Process

Is our proposal practical, given ICANN's structure and history? Could ICANN adopt an auction plan, even if the ICANN Board of Directors were to be convinced that auctions best serve the public interest? Some may argue that the answer to these questions is "no." ICANN's unwieldy governance structure, it might be argued, will not permit a substantial shift in DNS policy.

We have already given some of the reasons for skepticism. Even if we focus exclusively on ICANN's board of directors, there are reasons to doubt that a consensus will emerge on what constitutes the public interest with respect to the operation of the root. As we have already discussed, ICANN's board has a complex structure, as does the nominating committee (NOMCOM) that selects a majority of board members.[549] The formal structure of the board interacts with ICANN's tradition of bottom-up consensus-based decision making. Many of the parties with an economic stake in domain name policy are represented directly or indirectly on the ICANN board and in the various supporting organizations that are the locus of bottom-up consensus-based decision making. The result is predictable. Any change in DNS policy that might adversely affect the entrenched interest groups can be opposed by a variety of delaying or blocking tactics. It would be surprising, given ICANN's structure, if the ICANN board were able to overcome such resistance in every case, and even more surprising if the board were able to reach speedy decisions that adversely affected entrenched players when the negative economic impact of the decision was substantial. gTLD auctions may be such a case.

Moreover, the ICANN board has institutional interests of its own. Board members are unpaid volunteers. The ICANN board does not delegate substantial policy making authority to the CEO. ICANN does not have a large professional staff. Indeed, compared to the FCC, which has a regulatory task of similar economic importance, ICANN's staff is miniscule. For example, ICANN does not have even

546. *See infra* pt. V(A) (Auctions and the ICANN Process).

547. *See infra* pt. V(B) (Alternatives to ICANN).

548. *See infra* pt. V(C) (A Recapitulation of the Argument).

549. *See supra* pt. V(B)(2) (The Internet Corporation for Assigned Names and Numbers).

a single economist on its staff, much less a Chief Economist with a large staff of highly qualified subordinates with PhDs. Given this bare bones structure, it would not be surprising if ICANN became dependant on its supporting organizations for information and analysis. But the supporting organizations are in even worse condition than ICANN itself. None of the supporting organizations have any full-time staff, much less full-time economists and lawyers. Given ICANN's organizational structure and lack of internal resources, ICANN's board has an institutional interest in avoiding decisions that will create conflict or controversy among the most powerful stakeholders. The lack of independent staff and resources means that controversial decisions would impose personal costs on board members—as they are personally lobbied and are forced to devote even more time to an already time-consuming process.

Despite these reasons for pessimism, we believe that gTLD auctions should be attractive to ICANN. First, there are good reasons to believe that members of the ICANN board have good intentions—that they attempt (given the constraints they face) to act in the public interest. One advantage of an auction plan is that it is relatively easy for the board to confirm for itself the arguments advanced in this paper. If the ICANN board consults economists who are acknowledged as experts in either auction theory and design or communications policy, they will soon discover that the case for auctions and against ad hoc public-interest hearings (beauty contests) is overwhelming. The theoretical case for auctions is well-confirmed by substantial regulatory experience. If the ICANN board consults with experts and policymakers at the FCC, they will hear a similar story. Although there are horror stories about badly designed auctions, the ICANN board can verify that a well-designed auction is far superior to the methods of root name space allocation utilized by ICANN to date. The fact that the case for auctions is not controversial among neutral experts will make it easier for ICANN's board to resist lobbying pressure.

In addition, auctions have institutional advantages for ICANN. Auction revenues could assist in putting ICANN on a sound fiscal basis—of necessity, a primary concern for board members and staff. Moreover, auction revenues would allow ICANN to hire sorely needed technical staff—particularly a Chief Economist as well as staff or consultants in other areas (such as linguistics and anthropology) relevant to DNS policy.

B. Alternatives to ICANN

If ICANN is unable to adopt an auction plan, are there alternative institutional mechanisms? The experience of the FCC suggests that there are. DOC could require auctions as a condition for renewing the MOU. Congress could mandate auctions by statute. We believe that these are inferior policy choices. The Internet is a global system of cooperation, and not the property of the United States government. A mandate of auctions by the United States might well be viewed as illegitimate by other institutions, particularly other nations and the ccTLD operators. For this reason, we believe that the best path to auctions is through ICANN and not through federal mandates. However, as new proposals for name space expansion appear, ICANN must either take them seriously or run the risk that another institution will be compelled to act to safeguard the public interest.

C. A Recapitulation of the Argument

This article has argued for expansion of the generic top level domain name space using a specific market allocation mechanism – auctions. In this conclusion we briefly recapitulate the several steps that support gTLD auctions.

First, the domain name space is scarce in economic terms. There are several dimensions to this scarcity. At one level, scarcity is due to the Internet's architecture, the hierarchical addressing system embodied in the Domain Name System (DNS). Theoretically, there could be an infinite number of top-level domain names, but one would have to revamp the current DNS and re-engineer the Internet to make it happen.

Another dimension of scarcity flows from the differential value that unique character strings have as domain names. For a variety of reasons, "cars.com" simply has more economic value than "rt85-e4.u9cj3," even if they were to point to the same IP Address. Differential value leads to scarcity, at least in meaningful and useful names.

A third level of scarcity is intentional, and not the result of engineering or economic forces. It results from regulatory choices by ICANN that have persistently limited the number of gTLDs to levels far below those warranted by any technical requirements. These limits create monopoly power in stakeholders who, by virtue of ICANN's structure, reinforce ICANN's resistance to name space expansion. Artificial and unnecessary scarcity has profound

consequences: it impedes economic growth and promotes rent-seeking by incumbents.

Second, domain names, both at the top and lower levels, are classic private goods as economists use that term to analyze allocation policies. They are both rivalrous and excludable. Preference for market allocation of private goods is supported both by economic theory and by experience in comparable telecommunications industries. As a matter of theory, regulatory decisions are inferior to market choices in determining the highest and best economic and social uses for the goods. Moreover, in the absence of transaction costs, regulatory decisions will have little impact on who ultimately gets to use the good, only on who reaps the windfall of below-market pricing.

The domain name space is functionally similar in salient respects to the spectrum and telephone numbering space. As an empirical matter, regulatory allocation of those scarce resources has been sub-optimal, and has done little to achieve the underlying goal and rationale of regulation—promotion of the public interest.

Third, experience at the FCC has demonstrated the economic and social utility of scarce resource allocation using auctions. Even telephone numbers will soon be auctioned off, rather than dispensed for free. Auctions reduce administrative costs, replace arbitrary decision making with predictable criteria, disentangle the web of agency capture, and produce revenue for the public or public interest programs. If properly constructed, auctions can approach allocative optimality from nearly all perspectives.

Fourth, specific auction design and implementation should proceed cautiously. ICANN should consult economists and auction specialists to construct and hold a test round. We have proposed, as a framework, a fixed-length ascending bid auction for fifty gTLDs. We think this number is technically feasible, economically supportable, and unlikely to materially disrupt existing expectations. The number might be higher or lower, and the auction design may be different, but the fundamental policy choice to hold an auction is, we believe, unassailable.

Fifth, alternative mechanisms, such as taxonomy or first occupation are either inefficient or counter-productive. A static root or lethargic expansion merely entrenches vested interests and perpetuates economic inefficiencies. The current "beauty contest" system is corrupt and disserves the public interest. It is anti-democratic, has solidified American hegemony over the Internet, and

violates ICANN's federal mandate to promote competition in name services.

Sixth, auction revenue will enable ICANN to pursue its contractual and bestowed mission—to maintain a stable root and domain name system. Surplus revenue, if any, will enable ICANN to accomplish public interest projects related to its jurisdiction—such as upgrading IP Addressing and inclusion of non-English characters in the DNS. gTLD expansion will also remove most of the monopoly pricing in name services. That, by itself, is an excellent public interest outcome.

In sum, the case for gTLD auctions is compelling. An obvious first step for the ICANN board would be to begin a process to seek independent advice from reputable economists and public policy experts. Once the ICANN board is satisfied that the case for gTLD auctions is sound, the next step is to begin a process of auction design.

While ICANN delays, the root lies fallow. Already years have passed without significant expansion of the root name-space; undoubtedly, the cost of delay has already been substantial. ICANN's laudable commitment to a bottom-up, consensus-based policy process should not be allowed to trump its most fundamental responsibility—to manage assigned names and numbers in the public interest. In the case of expansion of the root name space, that responsibility demands that ICANN proceed with deliberate speed.

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